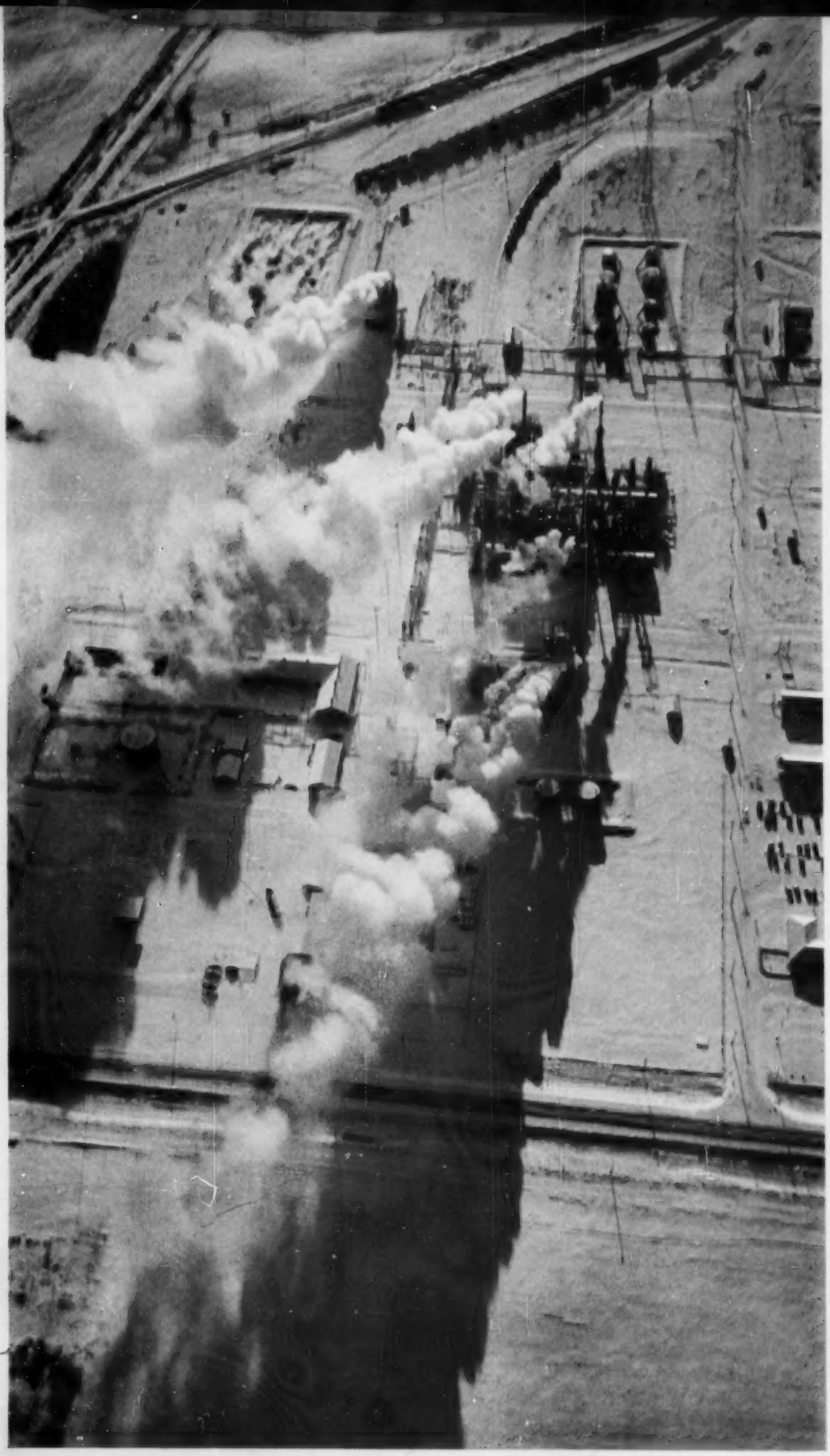

JANUARY 1956

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WORLD PETROLEUM

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How to get your top octanes more economically

By HAROLD J. GIBSON
Ethyl Corporation, Detroit, Mich.

With the growing trend to better-grade gasolines, the cost of producing those last few octane numbers has steadily increased. As a result, refiners are looking anxiously for more economical ways to get their top octanes.

Already octane numbers in the 97 to 98 range are being marketed in the East and Southwest. And the trends for all U. S. refineries in terms of pool, regular and premium fuels show that octane numbers are continuing a slow, steady rise each year.

To meet the demand for higher-octane fuels, refiners are being constantly forced to change their processes. In fact, trends indicate that by 1965 catalytic reforming may account for 50% of the total gasoline production in the industry.

Depending on the specific octane-improvement problem, the economic answer usually consists of a combination of tetraethyllead and various processing steps. The question becomes: How to determine the most economical way to get those top octanes? Only by conducting a detailed economic analysis can a refiner be sure of finding the best solution for his refinery, for from an economic analysis he can determine the proper balance between lead and a processing alternative.

An economic analysis will take into consideration all of the factors that affect the costs of making your gasoline: for example, optimum rates and yields, raw-material costs, product prices, operating manpower, maintenance and repair, utilities, depreciation, investment charges and reasonable "pay out."

Octane improvement analyzed

From such an analysis you can determine the economics of octane improvement, which is the tool for obtaining the optimum sequence of processing steps and attendant use of tetraethyllead. Analyzing octane improvement costs calls for a thorough understanding of unit operating costs, particularly when incremental expenses are being considered.

There are several approaches for analyzing the costs of octane improvement at higher levels. At Ethyl we have found, through our studies of the economics of top octanes, that the key to cost analysis is a value called *incremental cost*. Simply expressed, this is the rate at which costs increase as you raise the octane number. It can be expressed conveniently in cents per Research octane number per barrel. (¢/RONB).

Once you determine incremental costs, the next step is to make sure you are employing the best possible process at each point. By plotting the cost curves on a chart, you will see that up to a point the cheapest way to improve gasoline is with lead. Then lead becomes closely competitive with mild reforming methods.

After you reach an incremental cost of about 5¢/RONB, it again is definitely cheaper to add tetraethyllead. And finally when the full 3 cc. of lead is used, you must return to reforming—this time at greater severity.

Today there's a greater trend toward using lead in higher concentrations for, as one industry spokesman put it, "tetraethyllead has decreased steadily in price while the costs of refinery construction have continued to rise rather sharply."

FREE BOOKLET! Write for your copy of a recent 50-page report which gives important information on new processing alternatives and on the economics of top octane. Address your request to Department No. 16, Ethyl Corporation, 100 Park Avenue, New York, N. Y.

Lead addition now costs an average of 4 to 5 cents per Research octane number per barrel, and this is directly competitive with the cost of mild reforming operations for octane improvement. As product octane levels increase, refiners may have the choice of using maximum tetraethyllead—3 ml/gal—or going to more severe single-pass reforming or extraction followed by raffinate reforming. Here—even though lead susceptibility decreases somewhat in aromatic reformates—the cost of octane improvement by lead becomes increasingly more attractive as compared with various processing alternatives.

Where extremely high octane levels are required, a refiner has little choice but to use the more economic tetraethyllead to the maximum and then to vary his processing alternatives to give the desired product quality, if he wants to hold his manufacturing costs to a minimum.

What Ethyl Research offers you

Our Refinery Technology staff, backed up by the extensive facilities of the Ethyl Laboratories, will be glad to share their experience with your economics people when you conduct a cost analysis of your top octanes.

We will work with you, or if you prefer, we are even equipped to do a complete cost analysis for you.

We can help you answer these and other questions: When should you use "Ethyl" antiknock compound in preference to increasing the catalytic reformer charge rate? How does increased severity of reforming affect your costs? When should you carry your tetraethyllead content to the maximum allowable—and under what circumstances?

Your Ethyl Representative will be happy to arrange an appointment for you with one of our Refinery technologists.

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Simultaneous Gamma Ray Neutron Log Cuts Rig Time

Only 3½ hours were required to log 4,742' with McCullough's simultaneous logging equipment. Gamma Ray and Neutron Curves and a collar log were obtained on the one run, logging the interval from 7,500' to 12,242' in a Mississippi oil well. 5½" O.D. 20 lb. casing had been set to bottom and hole was full of mud.

McCullough's simultaneous logging equipment is available in an increasing number of service areas. Ask your nearest McCullough Branch for details.

McCullough Radiation Well Log Picks Up Four Foot Pay Zone..... Glass Jets Perforate for 240 B/D

A fine example of the accuracy of the McCullough Radiation Well Logger in locating, defining and interpreting the nature of a thin productive zone so that it could be perforated for maximum production, has just been reported from a Kansas oil field.

This was a new well. 5½" O.D. 14 lb. casing had been set to bottom. McCullough ran a Radiation Well Log obtaining Gamma Ray and Neutron curves and recording a simultaneous collar log.

The log revealed a thin, four foot zone at 3856' and indicated that it was productive. The interval was shot from logging curves and collar log measurements with McCullough's 4" O.D. Super Casing Glass Jets in Steel Strip Carrier, four holes per foot. Total logging and perforating time was only three hours.

After perforating, the well had a good show of oil. Zone was treated with acid and made 240 barrels per day on test, which was a very good well for the field.

The McCullough Radiation Well Logger is the most accurate, reliable and efficient logging instrument available. It has greater stability, provides more detail and assures more accurate quantitative interpretation.

Because of the extreme efficiency of the scintillation counter in detecting radiation and because of its very short length, it is possible to log beds as thin as 12" with clarity and accuracy.

Whether the pay zone be thick or thin, the simultaneous recording of a collar log means placing the perforations exactly where they are wanted . . . fully covering the productive formation.

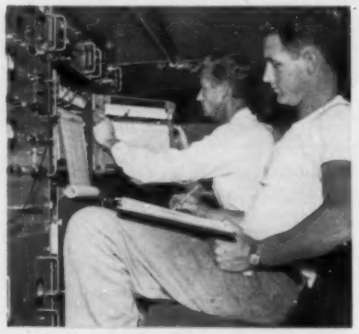
McCullough Log Finds Ten Feet of Pay Behind Casing

Sixteen Standard Casing Glass Jets Shot in 10' of Cased Off Pay Zone Increase Production from 5 B/D to 30 B/D

Many times the McCullough Radiation Well Logger has been instrumental in turning a poor producer into a profitable operation. While this Oklahoma well was a small producer even at its best, the 500% increase in production gained through the use of McCullough Logging and Perforating Services meant the difference between loss and profit.

The operator had set 4½" O.D. 9.5 lb. casing on top of the pay zone. The interval was treated but the resulting 5 barrels per day of production was considerably below the average for the field.

McCullough was called to run their Radiation Well Logger. Gamma Ray and Neutron curves were obtained along with a simultaneous collar log. It was found that 10' of pay zone lay behind the casing at approximately 1645'.



Interior of McCullough Radiation Well Logging Truck showing electronic instrumentation, controls, recorder, etc. At this panel down-hole information is evaluated and recorded with extreme accuracy

Sixteen shots were fired in the 10' interval by a McCullough Standard Casing Glass Jet Perforator with Steel Strip Carrier. The well is now making 30 barrels per day—a good well for the field. Total time on the job for both logging and perforating was one hour, twenty minutes.

As a result of the success of this job the operator is now logging and perforating all his wells in the area.

It always pays to call McCullough. You can be sure of exactly locating and defining potentially productive formations. You can be sure of deep, uniform penetration of the pay zone by the "world's hardest shooting perforators."

Technical Article Available

Copies of a technical article titled "Application of Radioactive Isotopes in Water Flood Operations" are available on request.

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Washington PIPE LINE

By Joseph B. Huttlinger

A new session of the U.S. Congress starts up this month, and once again, it is expected to give a great deal of attention to the American Petroleum and natural gas industry.

In fact, the second session of the 84th Congress may give more time to oil and gas than to any other single subject except, perhaps, taxes, which may be lowered a notch in this election year.

The major piece of legislation as far as oil and gas producers are concerned is the natural gas bill, which would remove some of the strict price and other controls over the more than 5,000 independent producers of gas in the U.S. Most of the major oil companies are included in the ranks of independent gas producers.

A quick look at issues that also are sure to come up, or likely to come up during the year, must include, oil imports, the income tax depletion allowance, gasoline taxes, more highways, gasoline dealer problems, taxation of oil earnings outside the U.S., offshore oil operations, proration, and voluntary agreements on tankers and foreign supply. This is by no means a complete list.

The natural gas bill was passed by a narrow majority in the U.S. House of Representatives last year; it has been reported by the Senate Commerce Committee, and now awaits action by the full U.S. Senate. The outcome is in doubt, and much may depend upon whether President Eisenhower comes out strongly for the measure.

The President may give his views in his "state of the union" message in January, in his annual budget, and in his economic report. The three documents, together, represent the fullest statement each year of the views and wishes of the President. President Eisenhower has yet to speak out for easing up federal controls over gas producers, although the pending gas bill is based on the views of a Cabinet Committee which he appointed.

Statistically, the Senate has the votes to pass the gas bill, some sources count more than 55 votes out of 96 senators for the measure. But members are apt to change their minds, particularly if the new and vigorous campaign of the gas distributers, now joined with 263 city mayors, gets into high gear. At least 45 gas distributing companies have joined a committee to fight the gas bill. The price control began June, 1954 after the decision of the U.S. Supreme Court in the case of the Phillips Petroleum Co.

Pending final outcome of the gas bill, oil imports will take a back seat in Washington, it is widely felt. Ultimately, however, it would surprise no one if the U.S. Congress once again were asked to enact laws to restrict imports of crude and residual oil in the U.S. Barring that, the Office of Defense Mobilization will be under pressure to take steps to slow down imports. At present, the ODM is in the midst of a study of the levels of imports to see if they exceed the Cabinet Committee formula set forth nearly a year ago, in February, 1955. ODM may hold public hearings on imports.

Officially, the Eisenhower Administration is still studying the 27.5 percent depletion allowance, and it will have a chance to give its views in the next few weeks. Few expect an attack on the allowance, however. But individual Senators and members of the House may assail the income tax provision, which encourages the hunt for oil. The attacks could take on steam as this is a tax-cutting year; some may suggest a trade, under which the government would pick up more revenue by cutting down the depletion allowance, and then give it away again by cutting taxes on low bracket incomes. This may be economic nonsense, but this is a strictly political year.

The Eisenhower proposals for a sharp step up in highway construction are being aired in committees, after a narrow defeat in the last session. Everyone is in favor of more highways, so the chances are good a bill will pass; but there is a wide split on just how to pay for the highways, which is sure to make trouble. American petroleum industry is on record that the highways can be built without raising the federal gasoline tax which is now two cents a gallon, but others are skeptical. Higher taxes on tires and tubes, trucks, automobiles, lube oils also are eyed.

The problems of gasoline dealers, the subject of weeks of hearings by several committees in half a dozen cities last year, are sure to come in for lively attention in the coming year. Whether anything will come of it is to be seen, but few would be surprised to see new legislation of some sort. A number of Senators and House Members are pushing legislation to forbid price cuts by a major oil company to one dealer that does not go to all dealers in this area; and Representative James Roosevelt, D., Calif., is urging legislation for the government to finance law suits of dealers against their major oil company suppliers. National Congress of Petroleum Retailers, the major trade association of dealers, is more active than ever, and is looking toward help of Department of Justice and Federal Trade Commission, as well as the U.S. Congress, in its continuing problems. Price wars are a big complaint of dealers.

Under the Defense Production Act, Attorney General Herbert Brownell, Jr., is presently making studies of three phases of petroleum operations from the standpoint of the antitrust laws. One covers the Interstate Oil Compact, and a report is due next summer, probably the first report demanded of the department by Congress on the compact in 21 years. Another covers a voluntary agreement on tankers and a third a voluntary agreement on foreign petroleum supply. Mr. Brownell, has indicated he wants the tanker pool ended, and that he wants an "alternate" for the foreign supply committee, which gathers figures on worldwide oil supply and demand for the Department of Defense. February may bring the reports on the two voluntary agreements.

The tidelands matter is still in for attention, with a court suit coming between the state of Louisiana and the U.S. Government over the boundary line. Of the coast of Texas, the boundary line also is in for U.S. attention. Elk Hills Naval Petroleum Reserve, operated by Standard Oil Co. (Calif.) is under study, on a plea by the company for modifications, and Secretary of the Interior Douglas McKay is studying opening up the Gubik oil and gas fields in Alaska to development by private companies. Only fear of charges of "give away" held him back, it is generally felt.

The idea of government aid for a crude oil pipe line from West Texas to California is up for attention, again in December in hearings before the House Armed Services Committee. As for government aid for oil lines to the East Coast, that appears all but settled.

Dr. Arthur S. Flemming, director of defense mobilization, once said the U.S. needed oil line capacity to carry up to one million barrels daily of oil to the East Coast in the event of war. Half the oil, he said, was to come from the Gulf Coast, and half from other areas.

Now, he feels Canada and the Williston and Denver Basins, and other areas have grown, can supply the entire need. Therefore, he feels there is no longer a need for 500,000 barrels daily from the Gulf Coast. Therefore, the government only needs new pipe line capacity to the East Coast from Pittsburgh, Pa. to obtain that, he said he is considering several proposals, including stockpiling pipe and valves.

All in all, this could be a year of much activity in Washington in the petroleum area. The news headlines may be devoted to who is going to be elected President next November and will Mr. Eisenhower run again. But of far greater importance to oil and gas is what, exactly, is the Congress doing? What is the government doing? This is what will affect oil and gas if not the security of the nation.

Elk Hills Revision Due

Standard Oil Co. (Calif.), which operates the Elk Hills Naval Petroleum Reserve, in California, is making one more try at revising its arrangement of years standing with the Navy Department. The change, which has been outlined to officials of the House Armed Services Committee and the U. S. Budget Bureau, would enable the petroleum company to take out much of its one-third share of oil in the basin quickly. At present, with the whole operation on a minimum production basis, it will take many years for the company to take out its share of the petroleum.

The remainder of the crude oil would be left in the ground for the Navy, and its status as a reserve would continue, largely, as at present. To make the changes, a number of details of financing and the like would have to be worked out.

The attempt is part of a long time effort of Standard Oil to get out from under its arrangement with the government. And the Navy, reportedly, is willing to go along with any sensible change. Presumably, members of Congress would go along too, but much depends upon the exact nature of any proposed changes.

The current proposal of the company is a trade out, under which the company would take out its one-third share of the shallow zone reserve, and let the Navy have the company's one third share in the deeper zone. This would give the company the right to take out millions of barrels as quickly as it saw fit, if approved. The Congress must give approval. At first, Chairman Carl Vinson, D., Ga., chairman of the House Armed Services Committee objected that the proposed change has not "sufficient advantages" for the Navy. He kept the door open for a different form of revision.

If the company pushes ahead for a change, the chances are excellent there will be Congressional hearings. If so, they might bring major changes in the present setup, under which Standard Oil has been operating the reserve which was created in 1912.

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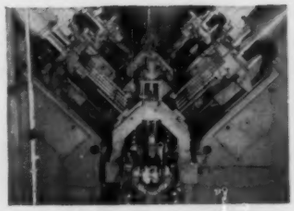

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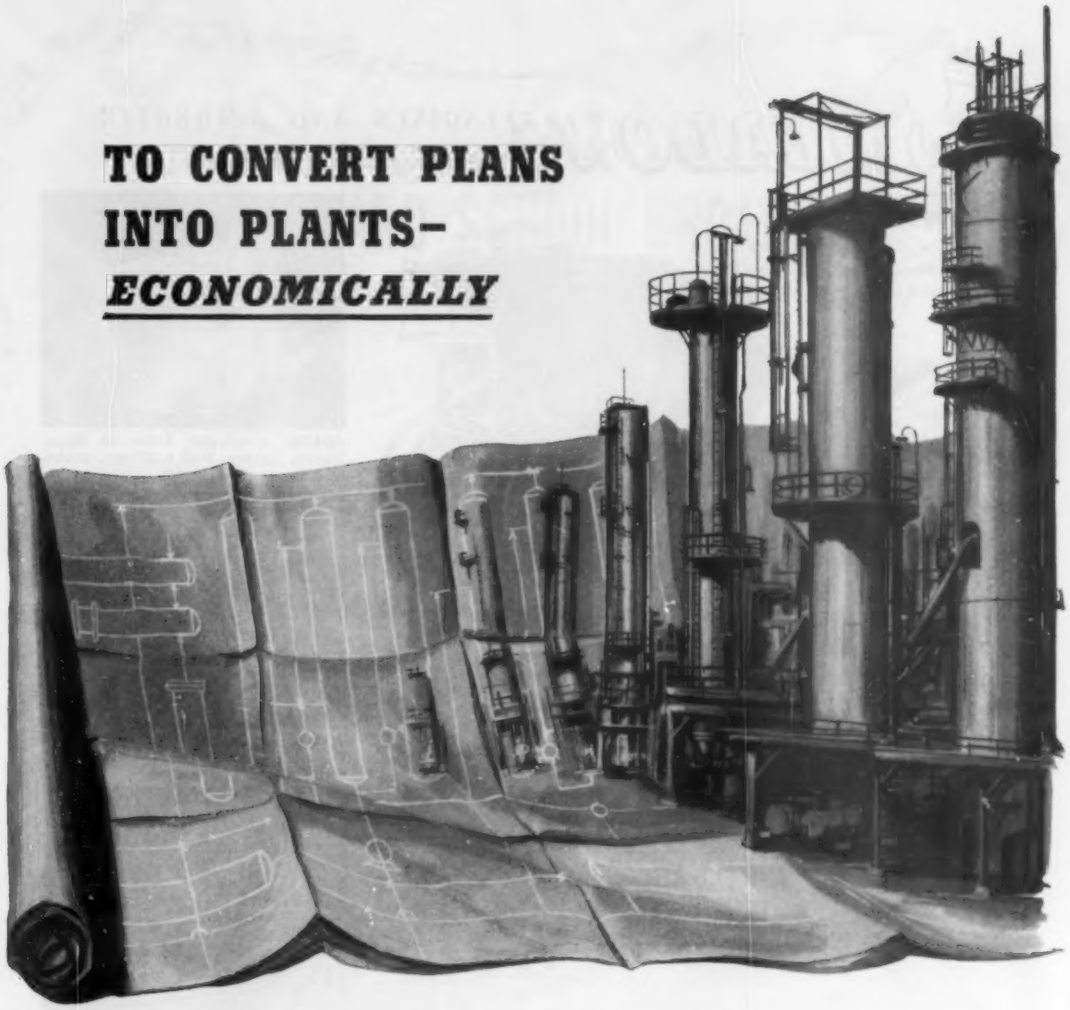

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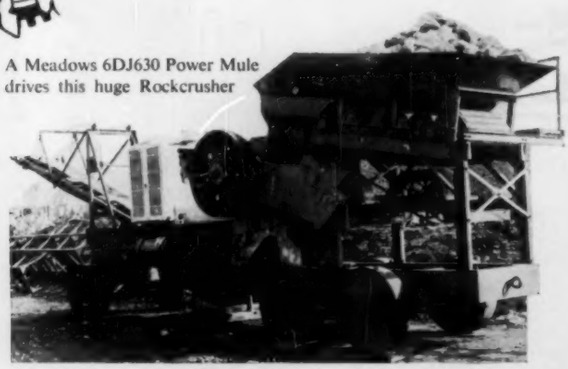

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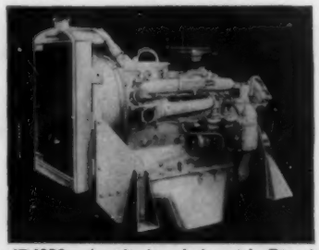
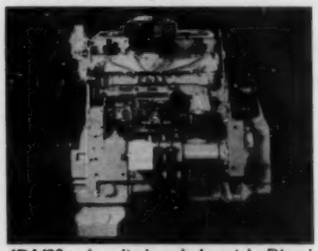
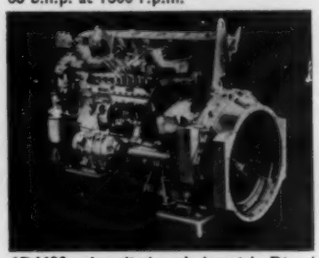


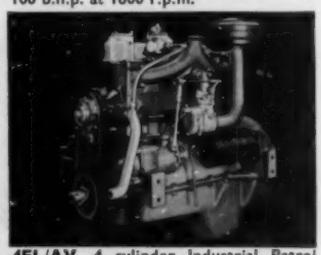
4DJ330 4-cylinder Industrial Diesel Engine. 120 mm. bore x 120 mm. stroke. 65 b.h.p. at 1800 r.p.m.



4DJ420 4-cylinder Industrial Diesel Engine. 130 mm. bore x 130 mm. stroke. 66 b.h.p. at 1600 r.p.m.



6DJ630 6-cylinder Industrial Diesel Engine. 130 mm. bore x 130 mm. stroke. 100 b.h.p. at 1600 r.p.m.



4EL/AV 4-cylinder Industrial Petrol Engine. 42 b.h.p. at 1800 r.p.m.

THE MEADOWS INDUSTRIAL RANGE

12 hour rating B.S.S. 649/1949	DIESEL					PETROL	
	4DJ 330	4DJ 420	6DJ 630	6DJ 970	6DJS 970	4EL/AV	6PJ 630
No. of Cylinders	4	4	6	6	6	4	6
Capacity (litres)	5·43	6·9	10·35	15·9	15·9	3·7	10·36
B.H.P. at 1000 rpm	35	44	66	107	153	26	76
" " 1200 "	42	53	79	127	183	31	92
" " 1500 "	54	63	96	150	220	38	113
" " 1600 "	57	66	100	—	—	40	119
" " 1800 "	65	—	—	—	—	42	132
Fuel consumption on full load	·41	·4	·385	·40	·375	·57	·66
	(lbs/BHP/hr)					(pints/BHP/hr)	

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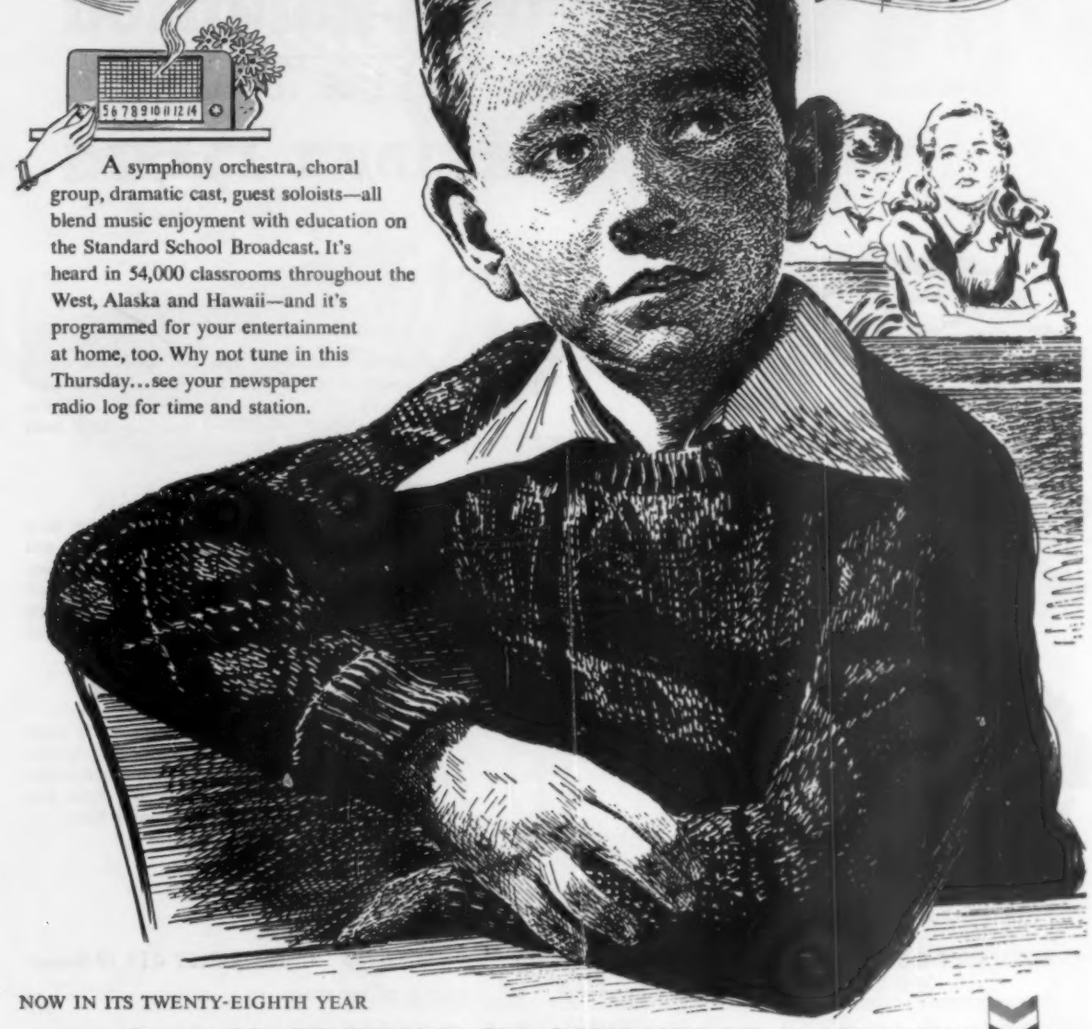

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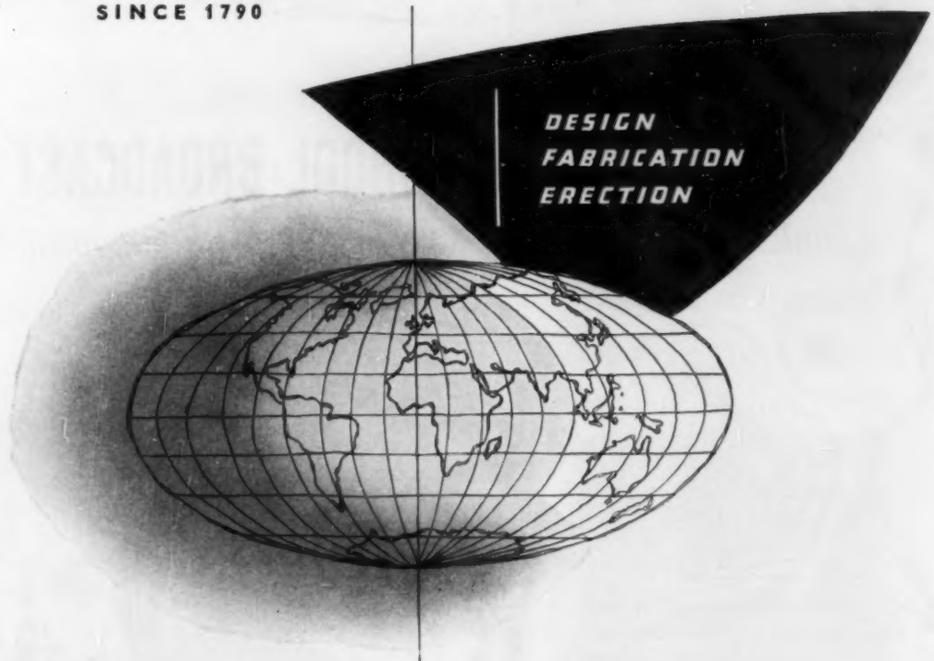

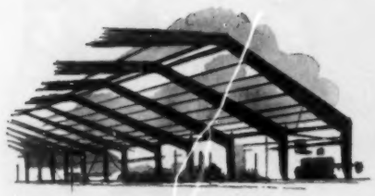

Constructional Steelwork

Examples of Butterley structural steelwork are to be found in all parts of this country and in many countries overseas. In recent years, experiments to perfect methods of welded structure have been highly successful.

Bridge Construction

Railway and road bridges built by Butterley have been supplied to undertakings in Great Britain and many countries abroad. The Butterley Company was one of the pioneers of the "rolling-in" method now universally adopted. To-day, welded methods are widely used, but many bridges are still of riveted construction.

Standard Unit Bridges

Butterley Standard Unit Bridges are in use in many countries providing the ideal solution to speedy bridge construction in places where site preparation is difficult or skilled labor scarce. From five standard units all sizes of bridge can be built.

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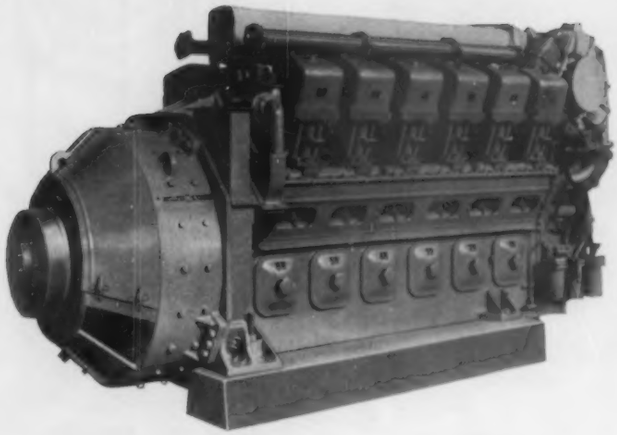

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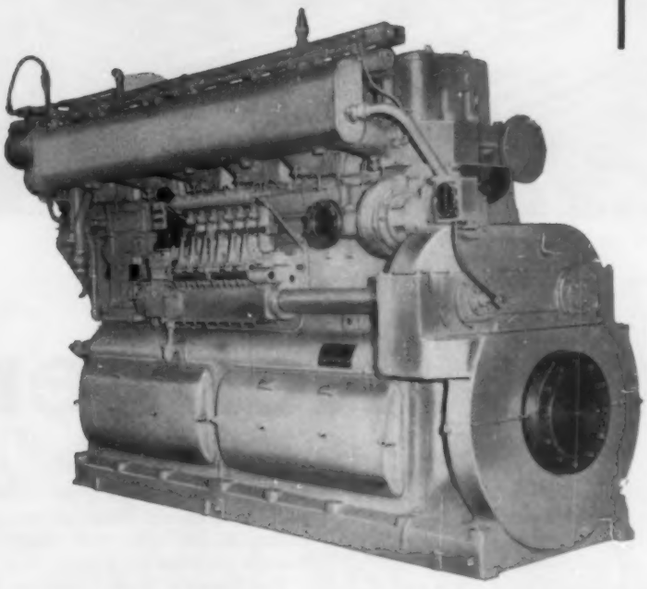

• Also Diesels, thousands of which are in service in many parts of the world, have, for many years now, given good proof of their rugged efficiency and sound design in a number of widely varied fields of operation. If you are in the market for diesel power, consider Dominion.

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Left is the administration building at Dorah, with general view of the refinery above and right

Iraq's Newest Refinery

The new 24,000 BPD refinery at Dorah, near Baghdad, is the largest and most complete petroleum processing project yet undertaken by the Government of Iraq. Designed and built by The M. W. Kellogg Company and Kellogg International Corporation to use Kirkuk crude, it is an important step forward in the utilization of Iraq's own resources to meet increasing domestic demands for fuel.

Products now being obtained at Dorah are stabilized gasoline, kerosene, light gas oil, diesel oil, and residual fuel oil. This production is accomplished by a single combination unit composed of the following integrated processes: atmospheric topping of crude oil, single pass visbreaking of reduced crude, recycle cracking of heavy gas oil, thermal reforming of heavy virgin naphtha, vacuum flashing of combined evaporator bottoms, gas recovery, and stabilization of combined gasoline.

The Kellogg organization is privileged to have been also responsible for the gasoline and kerosene treating units, the complete power plant, and requisite auxiliaries. Other facilities, unique to most refineries, are a sulfuric acid plant for the manufacture and reclamation of acid used in processing, and complete can fabricating and filling plants.

In the construction of Dorah, as on other Kellogg projects overseas, the greatest possible use was made of local labor and supervisory personnel. The refinery is now run by Kellogg-trained operators, many of whom were recruited locally, who took over within four months after the plant went on stream.

The Dorah refinery is another example of M. W. Kellogg's ability to design and construct processing facilities anywhere in the world, to meet local requirements and provide the optimum relationship between investment and return. We welcome the opportunity to put this experience to work for you.

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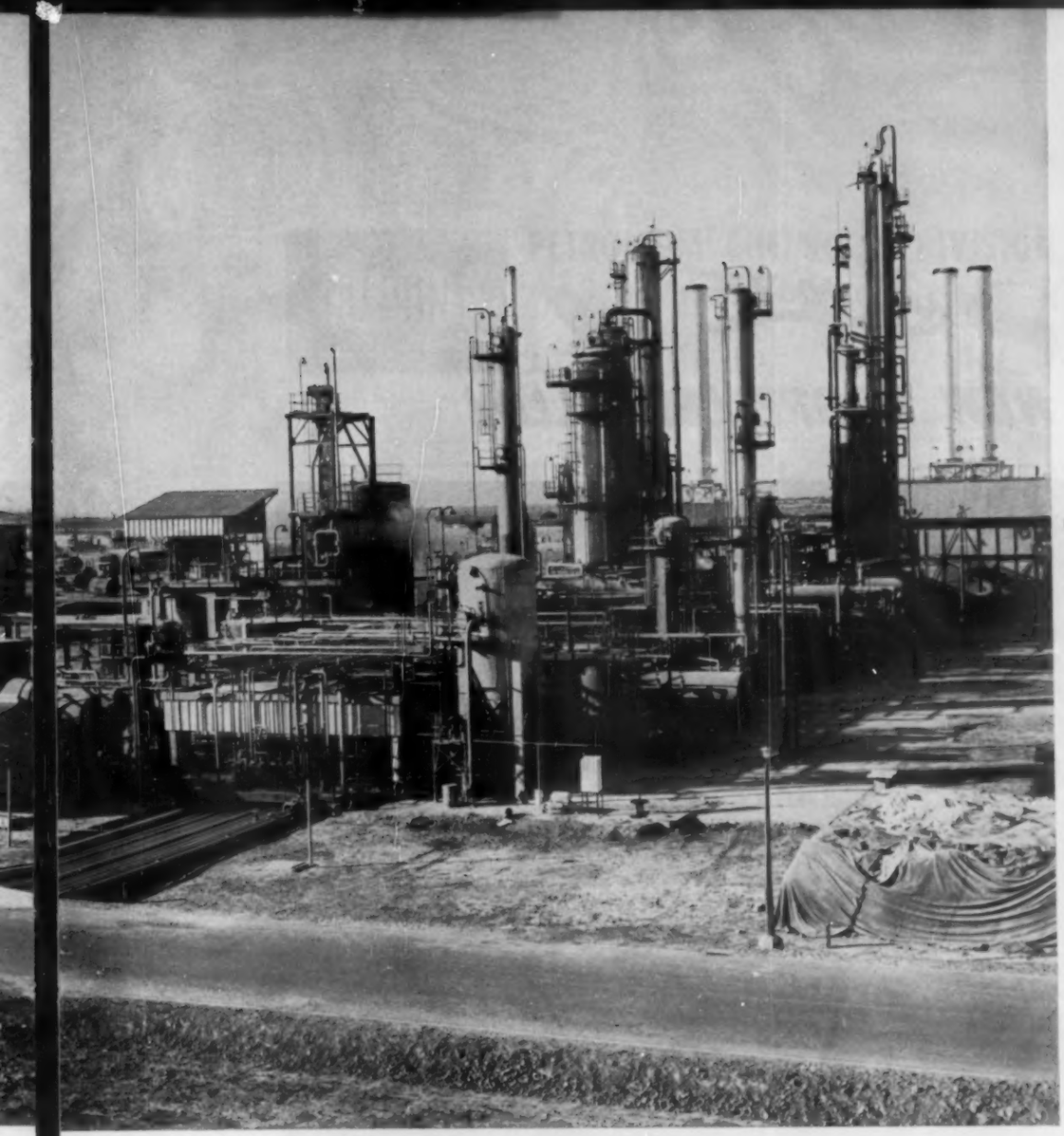
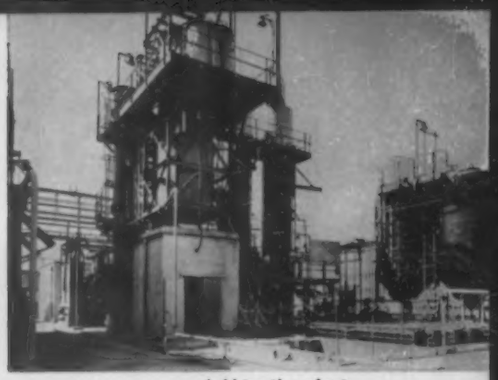




Acid treating plant

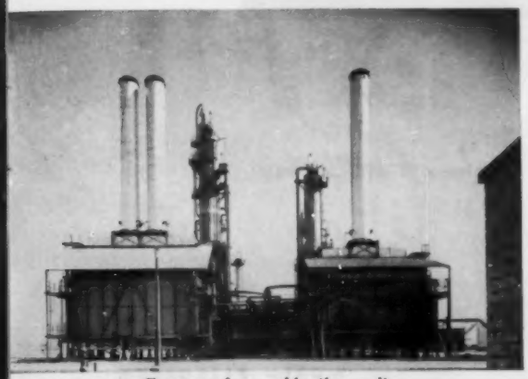
Part of the water-oil separator

Docking facilities on the Tigris

Section of the main control room

Combination topping and cracking unit

Section of the large tankage area



Furnaces for combination unit

View of kerosene treating unit

Loading tank cars

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DU PONT

PETROLEUM CHEMICALS DIVISION

NEWS

DU PONT

January ★ One of a Series of Interest to the Petroleum Industry ★ 1956

QUESTION BOX

1. WHAT is the *"typical"* American service station operator's reaction to price wars?
   (see article at right)
2. WHERE can you look for new program ideas for your next dealer meeting?
   (see below)
3. WHOM can you contact for technical service in the Gulf Coast Region?
   (see next page)
4. HOW can you prevent *gel-clogged* heating oil lines?
   (see next page)

ANOTHER DU PONT MARKETING SERVICE

Wide selection of program aids available for dealer meetings

During recent years, a wide variety of sales promotion aids have been developed by the Du Pont Petroleum Chemicals Division. These are all designed to be readily adaptable by any oil company for use in its own marketing program. And they make ideal program material for dealer meetings.

A new movie, "When the customer says 'KNOCK,'" is one example of the material available. This explains the common causes of knock other than gasoline quality and helps your dealers answer customer complaints in a salesmanlike way. You can follow up this film with a series of cartoon booklets that will help the dealers remember its message.

Another unique film presentation showing dealers how they can easily *sell themselves* is narrated by an animated cash register. And there are flannelboard presentations on gasoline and lubricating oil quality. Chassis dynamometer and single-cylinder engine demonstrations are also included. For special programs, you can even arrange to use the Du Pont fleet of fuel test cars.

For more information on these and other dealer meeting aids, just get in touch with any of our sales offices. Ask for a copy of "Sales Promotional Aids for Dealer Meetings."

WHO is your "typical" dealer... and HOW does he operate?

Many important facts about the man and his business are revealed in Report No. 4 of Du Pont's continuing market survey, "The Service Station Operator"

Thousands of customers form, confirm, or change their opinions of your company every day . . . based on the impressions made by your service station operators. Because of this, a composite, cross-section picture of the average dealer can be valuable to you in formulating dealer policies and sales promotion plans.

"The Service Station Operator" is a new Du Pont survey designed to give you a clear, concise picture of the average American dealer . . . his employees, his business, his opinions, his background, his relation to his petroleum products supplier, and his motivations. Three reports on this survey have already been published and made available to marketers by the Du Pont Petroleum Chemicals Division.

They cover (1) such dealer retail functions as station hours, gallonage, credit and mailing lists; (2) dealer knowledge of products, additives, sales assets, and prices; and (3) opinions on dealer meetings, advertising, dealer publications, and sales aids.

Report No. 4

The fourth report in the series, which has just recently come off the press, discusses the dealer's relationship with employees, his income and reactions to price wars, and his interests in dealer association activities.

The statistics included in the report are graphically illustrated with charts and are enlivened by cartoon drawings. This format makes the important points easy to reach, remember, and refer to.

What happens when . . .

For example, how does the average dealer react to a price war in his own marketing area? That is one of the factors influencing your business which is covered in Report No. 4.

Most of the dealers who have experienced price wars, the survey found, encountered them within the past year. What did they do? . . . The biggest percentage of them met the competition by cutting their own prices. A number of them, however, decided to hold out and refused to cut their prices. Other interesting reactions are also tabulated in this survey report.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *"Dealer Survey"*

What's next?

A fifth report on "The Service Station Operator" survey is due to be published soon. This will be the most significant of the whole series of reports. It will discuss the interrelationships of all the factors covered in previous reports . . . such as how dealer meetings, station hours, price wars, and other variables affect sales volume.

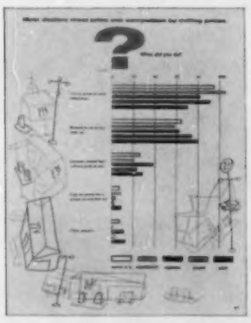
As part of the continuing market research work of the Du Pont Petroleum Chemicals Division, this dealer survey is the natural follow-up of an earlier survey on the buying habits of consumers at service stations. The interviews were conducted on a completely impartial basis by National Analysts, Inc.

Specialized cross-tabulations

Based on personal interviews with 2,633 service station operators – selected by the scientifically accurate area-sampling method – the survey is representative of all the operators in the United States. But the results can be broken down and cross-tabulated to give a true sample of any of four geographical areas.

And in addition to the regular distribution of reports to marketing executives, the entire survey has been tabulated on IBM cards, which will give a wide variety of specialized breakdowns to meet the individual needs of various oil companies.

For more information about this survey, just get in touch with any of our sales offices listed below.



HERE IS a typical page from Report No. 4 on "The Service Station Operator."

GULF COAST REGIONAL LAB MANAGER

John N. C. Cameron, manager of the Du Pont Petroleum Chemicals Division's regional laboratory in Houston, Texas, is in charge of customer service, product testing and additives treating recommendations for Du Pont customers in the Gulf Coast Region.

Before joining the Du Pont Company in 1949, Mr. Cameron was with the Research and Development Division of Humble Oil and Refining Company at Baytown, Texas. During his seven years with this company he worked as a research chemist on octane rating and light oil analytical research. He also did pilot scale research on catalytic treating. Prior to his assignment at Humble, he was employed for three years by the Gravity Meter Exploration Company in Houston.

After starting his college career at the University of Texas, he transferred to the University of Houston, where he received his B.S. degree in chemistry.

Mr. Cameron is a member of the American Chemical Society.

Gel-Clogged Heating Fuel Line!

. . . you can avoid this complaint

A rash of clogged fuel line complaints can quickly jockey you into some rather embarrassing situations. On the other hand, you can easily avoid this kind of trouble before it starts.

If the fuel oil is at fault, the clogging generally occurs in the line leading from the fuel oil storage tank to the burner, or at the screen ahead of the fuel pump. This clogging is generally due to the formation of a *gelatinous* material. And copper or brass are the culprits.

Since the feed-in line and the screen are often made of copper alloys, these are a potential source of copper mercaptides. If formed in sufficient quantities, the mercaptides become gelatinous in nature. So to prevent the clogging you must protect your fuel against the harmful effects of copper.

Here's how . . .

You can help assure adequate protection with DMD (Du Pont Metal Deactivator). It is highly effective in most fuel oil stocks in low concentrations (about 2 pounds per 1000 barrels).

This means that you can, in most cases, insure yourself against the harmful effects of copper—and promote better customer relations, too—at a cost of *less than ½ cent per barrel.*

For best results, it is recommended that you use DMD in combination with Du Pont Fuel Oil Additive No. 2 which guards against sludge.

THIS BOOKLET describes the properties, uses, and methods of addition of DMD. If you do not have a copy, any of our sales offices listed below will be glad to send you one.

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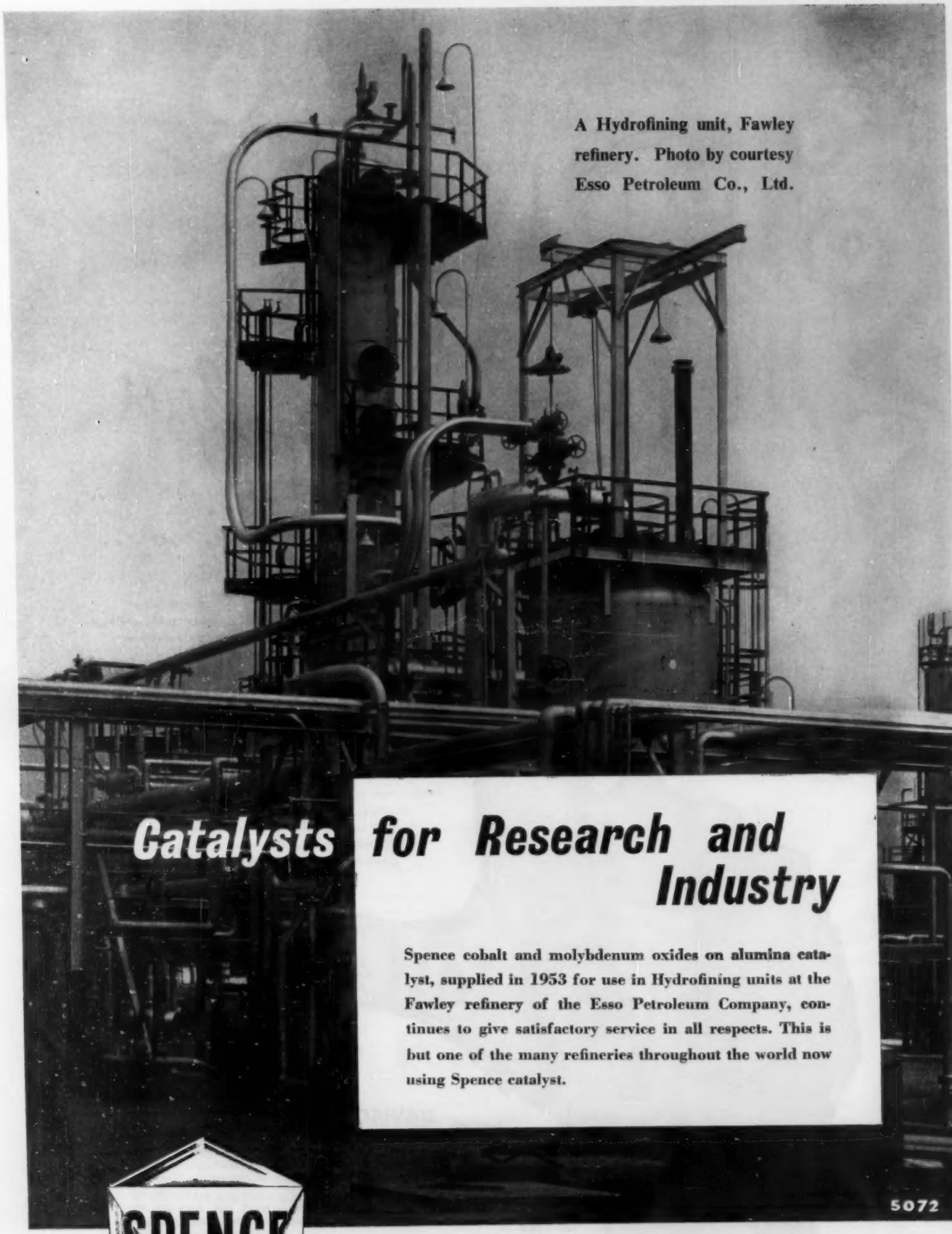

A Hydrofining unit, Fawley refinery. Photo by courtesy Esso Petroleum Co., Ltd.

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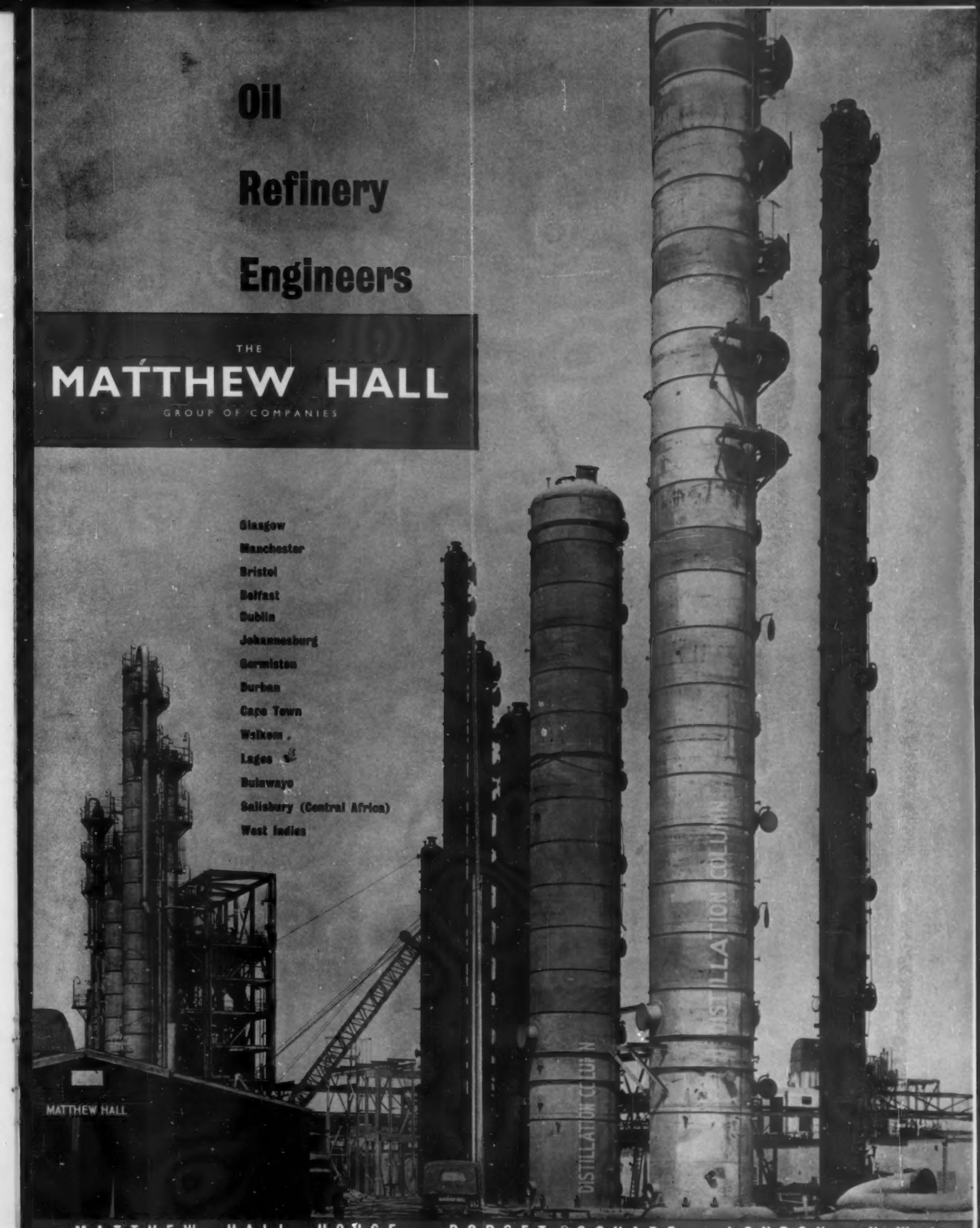

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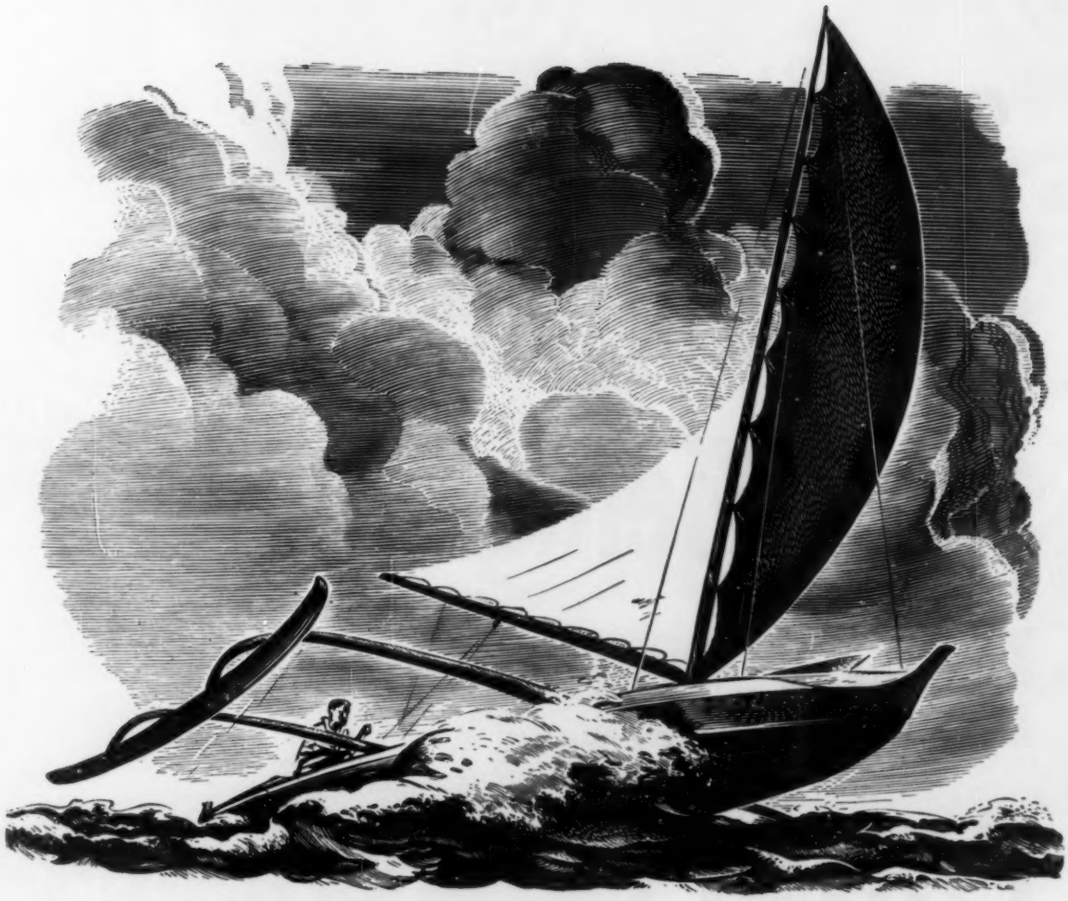

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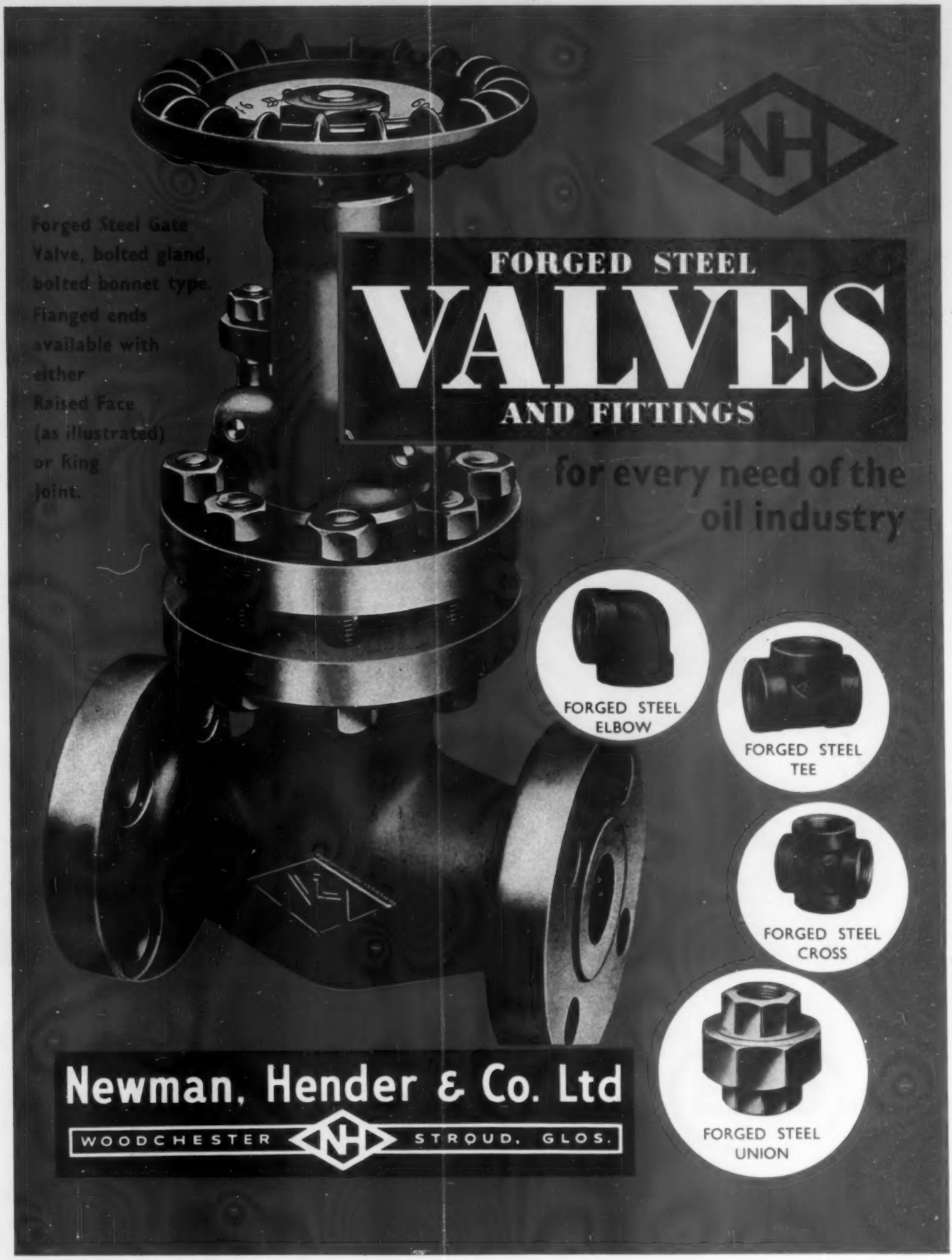
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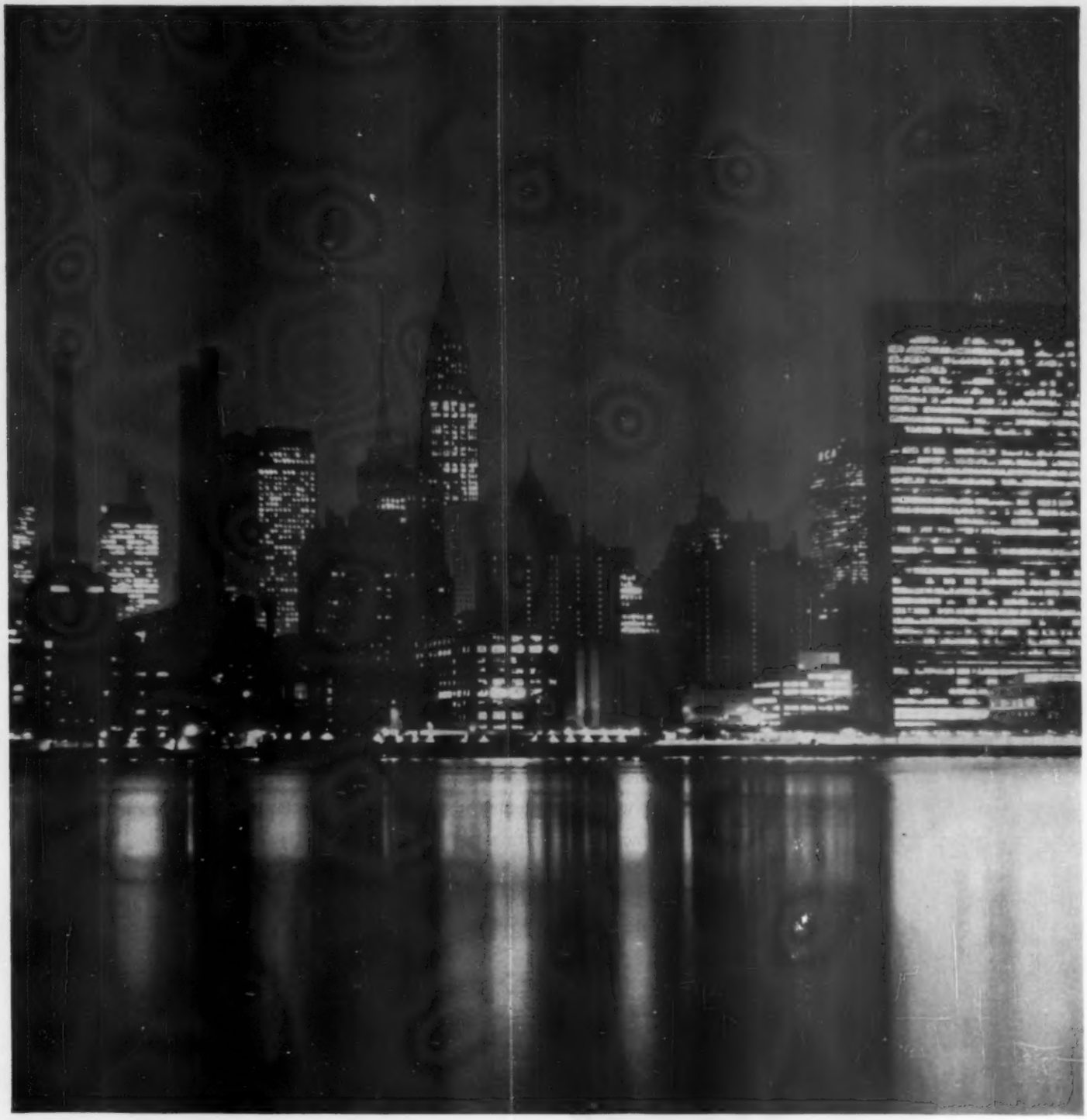

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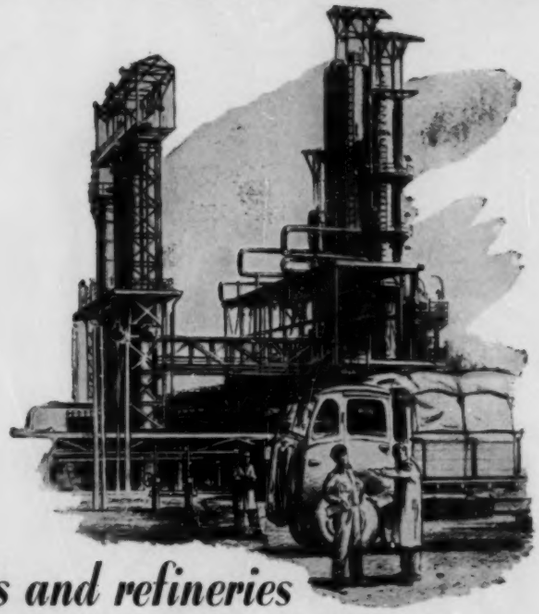

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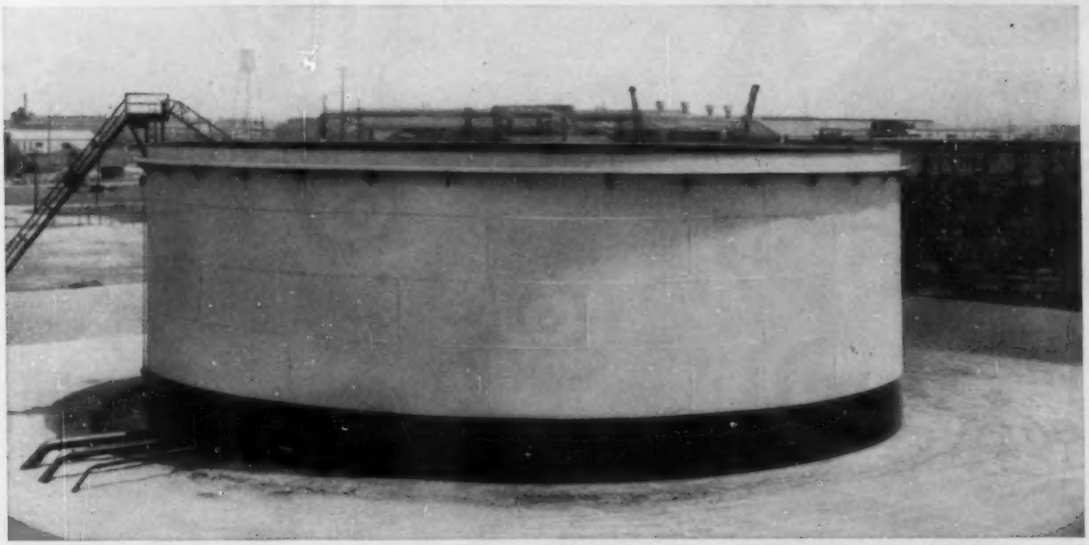

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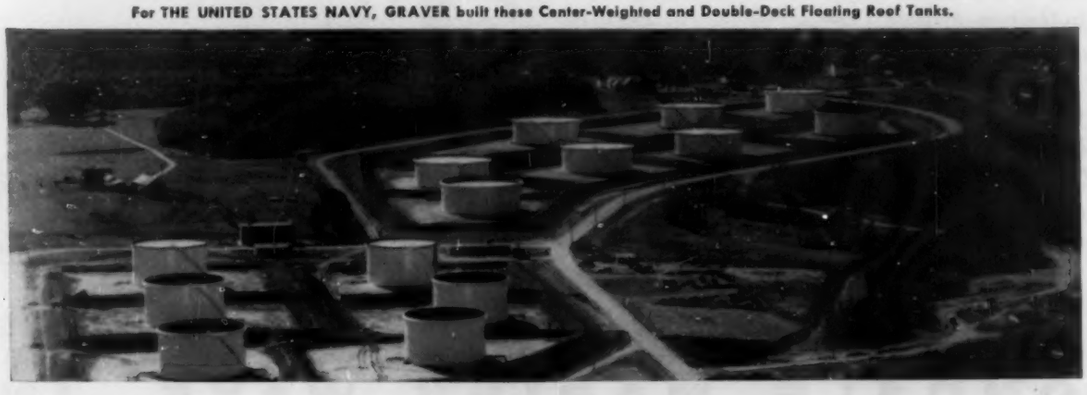

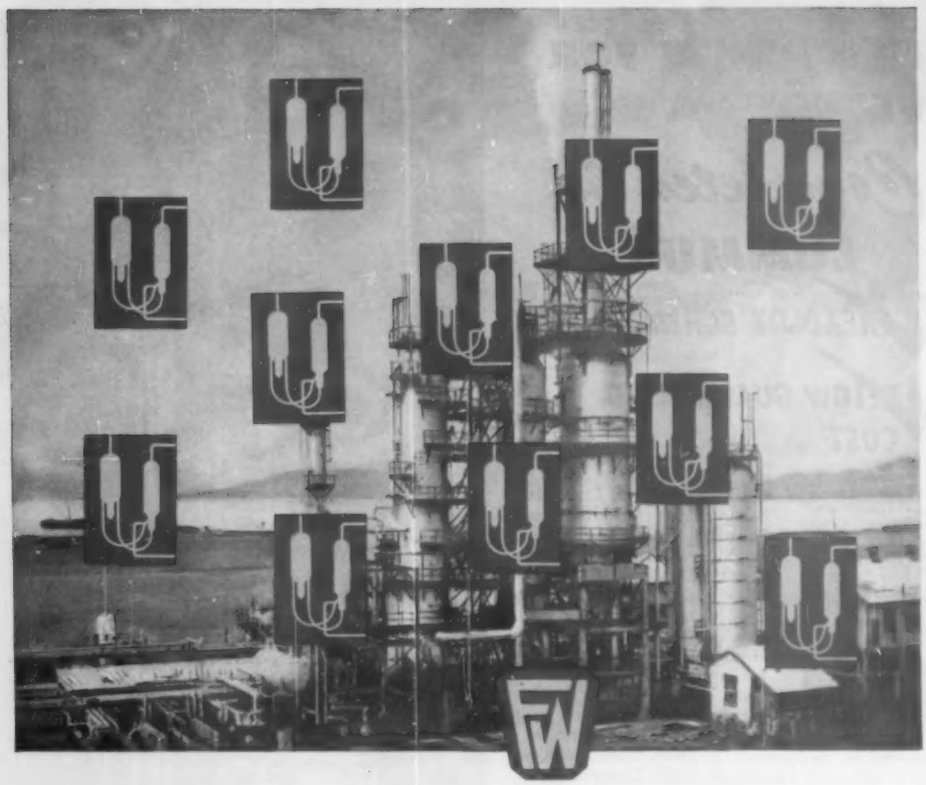

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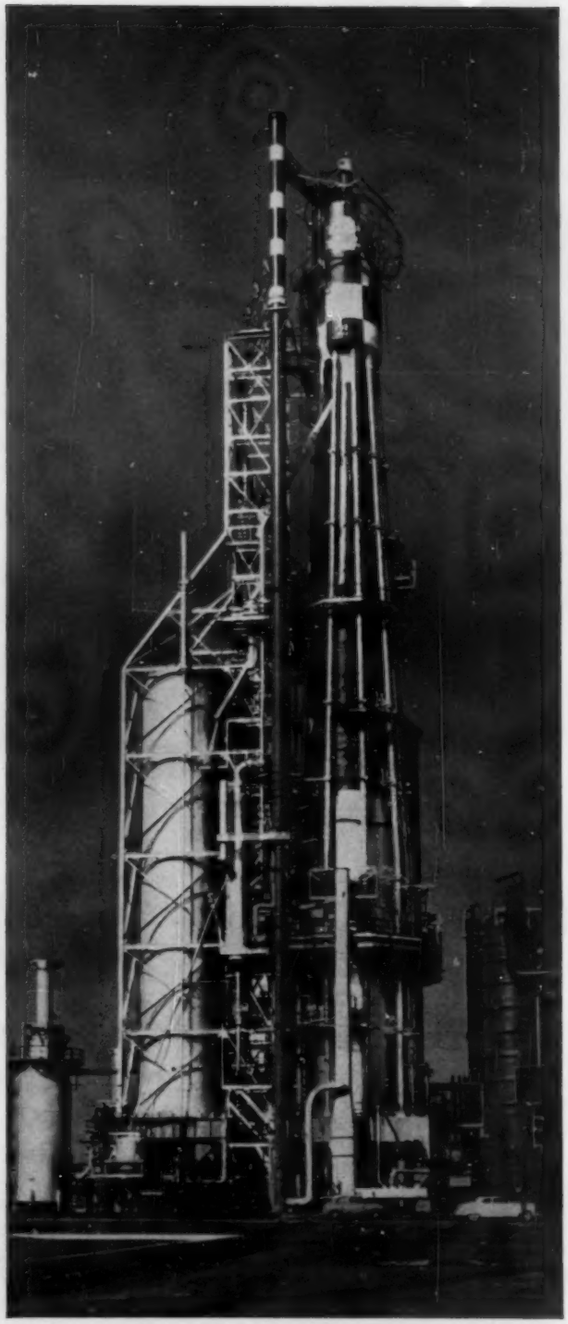

16,000 BSD Houdriflow Catalytic Cracking Unit

LUMMUS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

VOL. 27, NO. 1 JANUARY, 1956

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THIS MONTH'S COVER

In wintry weather the Edmonton refinery at Mc-Coll-Frontenac Oil Company Ltd. exhales long spirals of steam which quickly freeze into glistening crystals. Under extreme cold conditions the crystals give a foglike aspect which Canadians refer to as "smice" to contrast with the "smog" of industrial communities in warmer climes. Aerial photograph is by Isear and color plates are reproduced through the courtesy of Ellis Prudden, editor of The Texaco Star, house magazine of The Texas Company.

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What of 1956

So far as concerns American general business including petroleum and industries closely related to it, the situation could hardly be more encouraging than it is at the moment. With the American industrial machine working at capacity, the surprising growth in demand during the year just ended, consumer buying maintaining high level, employment at a peak and appropriations for capital investment in 1956 exceeding those of the past year, the outlook is favorable. Sixty million automobiles, vast plans for more highways for them to operate on, increased activity in field operations and enlarged appropriations for construction of plant facilities provide a promising background from which to view the immediate future. But in this time of uncertainty there is always the possibility of changes that will upset the most favorable outlook.

Practically every prediction by individuals or official agencies anticipates record activity during the first six months of the incoming year on the assumption that this period will be required to absorb the momentum, no matter what happens later.

Those who question the duration of the present high level of activity in the motor industry have been able to point out certain possible factors which may bring a levelling off or even a downturn in the automobile industry, asserting that the requirements for a sustained heavy volume of business are a strong consumer demand, an abundance of materials, labor and money, or its equivalent up to a certain point, credit.

Chief criticism of motor manufacturers from this source is that they are building too many cars. With production nearing 700,000 vehicles per month it is held that this number is much above normal requirements for new purchases and replacements and that to move the heavy output of 1955 it has been necessary to offer unusual inducements to buyers backed by a high powered advertising campaign and a moving forward of the usual date for introducing new models. This stimulation, it is held, will be reflected in a lowered demand which is likely to be felt before the end of 1956.

Actually nobody ever has been able to determine how many cars the American people can be induced to buy. From the time when power driven vehicles began to come into general use estimates have been put forward, but these always have been outdistanced by actual performance. A generation ago, in 1920, economists of high repute named 20 million as the ultimate in saturation, but with upward of 60 million cars in use this has been exceeded threefold. Figures of passenger car growth over the past decade show an average increase of six percent yearly.

A great deal of discussion has gone on recently regarding the rise in installment credit for which deferred payments for automobiles admittedly are largely responsible. Statistics of the Federal Reserve Board are quoted to show an increase of this form of indebtedness from $22 billion at the beginning of last year to $27 billion and that of current sales one-half are adding to the bill at the rate of $400 million per month. On this is based the charge that the present boom in automobile sales, if such it may be termed, is based largely on borrowing against the future and the prediction that when heavier repayments on outstanding indebtedness come due as they will begin to do before the end of 1956, they will bring about a serious drop in sales.

Against this line of reasoning those who believe that the American automobile industry is far from reaching the limit of its growth produce other statistics to show that in previous years, as in 1948-49 and again in 1953 when outstanding indebtedness had risen sufficiently above down payments to create fears of a glut of credit this imbalance was corrected voluntarily by car owners by temporarily raising repayments above the volume of new cash purchases.

Trustworthy statistics show that 75 percent of American families possess at least one automobile, the density of distribution varying greatly between the more populous states equipped with modern road systems and those lacking in these essentials. The remaining 25 percent presumably is made up of those who are so located that they cannot use a car to advantage or who feel that they cannot afford its maintenance. Recruits to the car-owning class from this group are likely to increase with the rise in average incomes and the spread of improved highways.

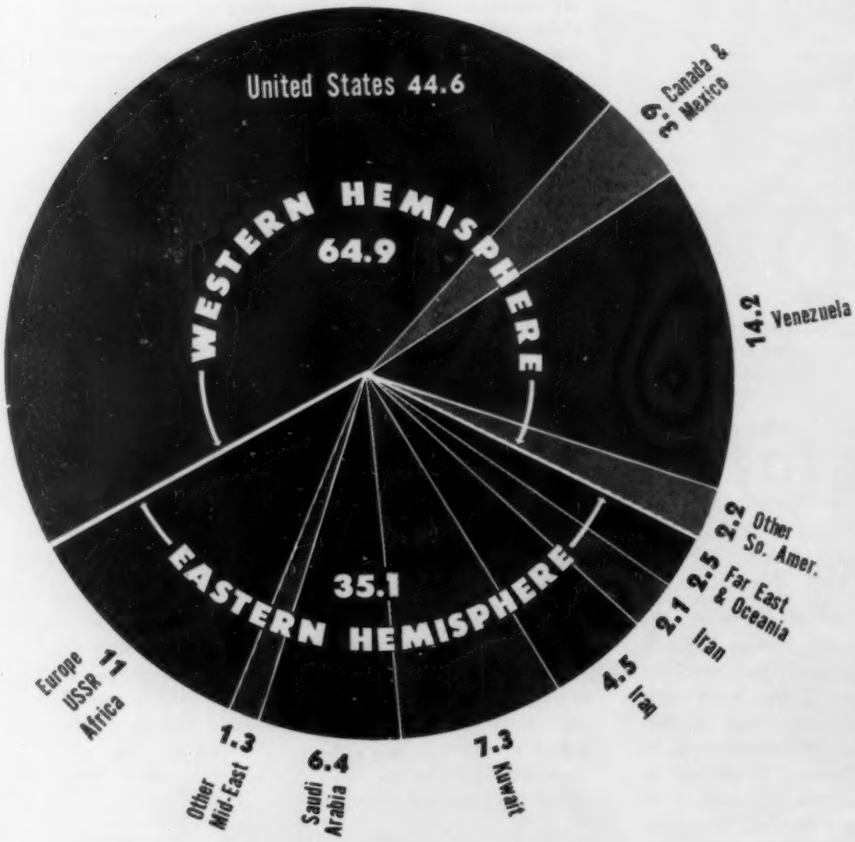
Significant among the marketing records of the past year is the large proportion of sales to families who feel the need of more than a single car. The establishment of new homes and the movement of population to suburban or country locations encourages this trend toward multiple ownership.

While it is possible that developments may take place of such far reaching effect as to alter business conditions the average American is inclined to put his faith in a continued rise of national income and a scale of business activity that will make 1956 a good year with a growth in activity of not less than five percent against a gain of 10.9 percent in 1956. An increase in domestic demand for oil of about four percent seems conservative.

Outside the United States the higher rate of growth that has been in effect throughout the post-war period is expected to continue in view of plans for intensified exploration and the need for additional refining capacity to meet the rising demand for petroleum products. A combined world increase to 16.6 million barrels daily is considered a conservative estimate for the current year.

World Demand for petroleum increased 8.75 percent in 1955 to 15.7 million barrels daily. Outlook for 1956 is for a rise to 16.6 million barrels daily.

World Production and demand Reach New Peaks in 1955



Percentage distribution of production

WORLD production of crude oil increased 10.9 percent in 1955 to 15,149,100 barrels daily according to estimates gathered by *World Petroleum*. The increase of 1,488,400 b/d compares with a rise of 560,700 b/d or 4.3 percent in 1954.

Output of natural gas liquids rose about 6.2 percent during the year to 885,000 b/d. Total new supply of liquid petroleum in 1955 was thus just over 16 million barrels daily.

The increase in production was made necessary by an astonishing rise in world demand for oil products. Market expansion was about 8.75 percent to 15,700,000 barrels daily. Above ground stocks of oil apparently increased again as they have in recent years. In the United States the increase is expected to be about 14 million barrels. Elsewhere throughout the world the increase in storage and transit oils may approximate 90 million barrels.

As this is written the outlook for 1956 is that demand will continue to rise throughout the world but at a somewhat lower rate than in 1955. At the recent annual meeting of the American Petroleum Institute John G. Winger of the Chase Manhattan Bank suggested that U.S. oil sales for domestic plus export will approximate 9,125,000 b/d, an increase of 4.3 percent over the 8,679,000 b/d total demand this past year. He believes that domestic refinery runs will have to average 7,865,000 b/d compared with 7,466,000 b/d in 1955.

Other economists who have restricted their estimates to domestic demand have stated that U.S. consumption will rise 4.5 or 5 percent to between 8.7 and 8.8 million barrels daily, exclusive of exports.

Indications at the year end were that an increase of about 7 percent in domestic demand outside the United States is not unreasonable to expect. On this basis world demand will rise to 16.6 to 16.7 million barrels daily during the current year.

Based on the 4.5 percent estimated rise in United States demand and 7 percent elsewhere in the world, demand for oil in 1956 may be compared with two previous years as follows:

World Consumption of Petroleum
(Thousands of Barrels Per Day)

	1954	Est. 1955	Est. 1956
USA	7,752	8,334	8,700
Other North America	764	832	885
Latin America	912	1,032	1,105
Western Hemisphere	9,428	10,198	10,690
Eastern Hemisphere	5,012	5,503	5,900
World Total	14,440	15,701	16,590

As indicated in an accompanying chart the Eastrn Hemisphere continued to expand its production at a more rapid rate than the west in 1955. The ratio was 64.9 percent in the west and 35.1 percent in the east. Comparable percentages in 1954 were 66.2 and 33.8. In terms of actual volume the increase still was greater in the western hemisphere with a rise of 773,300 barrels daily compared with 715,100 in the eastern hemisphere.

The eastern hemisphere now is virtually self sufficient. Including natural gas liquids the hemisphere produces about 5,460,000 b/d. and consumes 5,503,000 b/d. There is, of course, a considerable amount of cross hauling for one reason or another but, on balance, the inter-hemisphere movement is negligible.

Consumption in the eastern hemisphere increased 491,000 b/d or 9.8 percent in 1955. Crude output rose 715,100 b/d or 15.5 percent.

In the western hemisphere consumption rose 770,000 b/d or nearly 8.2 percent. United States consumption was up 582,000 b/d or 7.5 percent to 8,334,000 b/d. Canada will report an increase of 10 to 11 percent to about 600,000 b/d. South American and Caribbean nations will show a similar rise.

In volumetric terms the largest changes in crude oil production in 1955 were made in the United States, Iran, Venezuela, the U.S.S.R., Kuwait and Canada.

The return of Iran to large scale commercial production in October 1954 had the effect in 1955 of retarding the growth in output of other principal producing nations in the Persian Gulf area. Average Iranian output was 322,700 b/d in 1955 compared with 56,000 b/d the previous year. Room

WORLD CRUDE OIL PRODUCTION
(Thousands of Barrels Daily)

	1953	1954	Fourth Quarter 1955	Yearly 1955
NORTH AMERICA				
United States	6,465.7	6,346.0	6,789.0	6,752.0
Canada	221.6	262.7	390.5	347.5
Mexico	198.5	226.8	223.4	241.2
Total	6,885.8	6,835.5	7,402.9	7,340.7
SOUTH AMERICA				
Venezuela	1,765.1	1,897.2	2,236.0	2,152.3
Colombia	110.4	109.5	109.0	107.6
Argentina	78.5	81.3	85.0	83.2
Trinidad	61.2	65.0	69.0	67.4
Peru	44.0	46.7	47.0	47.0
Ecuador	8.1	8.4	9.9	9.5
Chile	3.5	4.8	8.3	6.9
Brazil	2.5	2.6	6.4	5.8
Bolivia	1.6	4.5	8.6	7.7
Cuba	0.1	0.2	1.4	0.9
Total	2,075.0	2,220.2	2,580.6	2,488.3
WESTERN HEMISPHERE	8,960.8	9,055.7	9,983.5	9,829.0
EUROPE & AFRICA				
Austria	60.0	62.0	68.0	65.0
Germany	42.3	51.8	66.0	61.4
Netherlands	15.6	17.8	19.5	19.5
France	7.0	9.8	19.0	15.5
Yugoslavia	3.0	4.2	3.0	3.0
French Morocco	2.1	2.4	2.2	2.2
Italy	1.8	1.5	7.0	4.3
Algeria	1.8	1.6	1.2	1.2
United Kingdom	1.1	1.2	1.2	1.2
Total (Excluding USSR)	134.7	152.3	187.1	173.3
USSR	1,040.0	1,145.0	1,375.0	1,300.0
Romania	140.0	150.0	150.0	150.0
Hungary	14.0	14.0	24.0	24.0
Poland	4.0	4.0	4.0	4.0
Albania	3.0	3.0	6.0	6.0
Czechoslavakia	2.5	2.5	2.5	2.5
Total	1,203.5	1,318.5	1,561.5	1,486.5
Total Europe & Africa	1,338.2	1,470.8	1,748.6	1,659.8
MIDDLE EAST				
Kuwait	862.0	955.8	1,125.0	1,106.0
Saudi Arabia	844.6	952.6	1,016.8	964.1
Iraq	576.1	628.7	730.0	682.0
Iran	26.8	56.0	353.0	322.7
Qatar	85.2	104.9	120.0	114.2
Egypt	45.2	37.7	28.0	31.7
Bahrain	30.1	30.1	30.0	30.0
Neutral Zone	—	16.5	30.0	25.7
Turkey	0.5	1.1	6.4	3.2
Total	2,470.5	2,783.4	3,439.2	3,279.6
FAR EAST & OCEANIA				
Indonesia	206.0	218.1	246.5	239.3
British Borneo	101.0	98.8	110.0	106.5
Japan	4.8	5.9	6.3	6.1
India	5.4	6.8	7.5	6.9
New Guinea	5.8	10.8	8.0	9.6
Pakistan	4.8	5.0	5.4	5.6
Burma	3.3	3.4	3.7	4.0
China	2.0	2.0	2.5	2.5
Total	331.1	350.8	389.9	380.7
EASTERN HEMISPHERE	4,141.8	4,605.0	5,577.7	5,320.1
WORLD TOTAL	13,102.6	13,660.7	15,561.2	15,149.1

ESTIMATED DOMESTIC DEMAND FOR MAJOR PRODUCTS

(Thousands of Barrels—Source: U. S. Bureau of Mines)

Country	Motor Fuel	Kerosine	Distillate Fuel Oil	Residual Fuel Oil	Lubricating Oil	All Major Products 1954	All Major Products 1953
NORTH AMERICA & CARIBBEAN							
Alaska & Hawaii	4,560	130	3,580	5,420	120	13,810	14,703
Canada	73,922	12,085	47,020	45,380	2,480	180,887	163,237
Central America	2,685	534	3,204	5,100	65	11,588	12,385
Cuba	5,100	699	2,050	10,050	175	18,074	17,660
Mexico	20,690	7,150	7,080	27,000	800	62,720	62,887
Puerto Rico	2,890	730	270	3,160	55	7,105	7,185
United States	1,238,346	118,260	526,369	522,099	38,444	2,443,518	2,450,265
West Indies, other	2,950	526	9,881	36,840	150	50,347	42,500
Total	**1,351,143**	**140,114**	**599,454**	**655,049**	**42,289**	**2,788,049**	**2,770,822**
SOUTH AMERICA							
Argentina	14,100	6,460	9,000	33,750	1,040	64,350	61,055
Bolivia	620	119	205	520	9	1,473	1,313
Brazil	23,230	4,175	9,418	19,900	1,320	58,043	50,043
Chile	3,198	1,161	1,426	5,023	184	10,992	9,244
Colombia	6,485	1,346	1,601	3,290	174	12,896	11,053
Ecuador	930	195	356	870	33	2,384	2,030
Paraguay	330	75	130	76	10	621	486
Peru	4,395	1,686	1,449	4,710	115	12,355	11,331
Uruguay	2,023	1,155	1,265	4,750	78	9,271	8,620
Venezuela	10,415	2,888	5,599	14,300	227	33,429	30,451
Total	**65,726**	**19,260**	**30,449**	**87,189**	**3,190**	**205,814**	**185,626**
WESTERN EUROPE							
Belgium & Lux.	8,468	1,091	7,650	8,940	675	26,824	22,758
Denmark	5,390	840	4,392	7,493	321	18,436	15,215
Finland	2,890	590	1,950	1,720	175	7,325	5,550
France	34,950	757	22,110	54,900	2,870	115,587	106,361
Germany, West	21,522	377	22,314	16,495	3,067	63,775	47,749
Greece	2,110	740	2,375	4,790	135	10,150	9,055
Iceland	395	25	682	710	28	1,840	1,361
Ireland	2,370	911	765	1,910	132	6,088	5,793
Italy & Trieste	11,550	1,740	12,414	47,900	990	74,594	55,073
Netherlands	7,250	1,790	10,300	17,100	650	37,090	32,921
Norway	2,815	340	5,650	6,810	290	15,905	14,877
Portugal	1,450	1,195	2,390	3,620	120	8,775	7,416
Spain	4,510	680	3,890	7,770	510	17,360	13,791
Sweden	9,575	3,580	16,390	17,120	600	47,265	39,260
Switzerland	4,085	365	5,780	1,870	235	12,335	10,327
United Kingdom	57,790	10,550	38,900	67,750	5,820	180,810	163,145
Total	**177,120**	**25,571**	**157,952**	**266,898**	**16,618**	**644,159**	**550,652**
MIDDLE EAST							
Bahrain	218	81	1,740	6,870	14	8,923	9,996
Iraq	1,250	1,290	570	3,550	100	6,760	6,180
Israel	1,460	1,180	1,206	3,900	90	7,836	7,401
Jordan	240	200	120	80	10	650	530
Kuwait	378	107	286	7,640	4	8,415	8,147
Saudi Arabia	1,125	290	2,510	10,500	25	14,450	13,002
Syria-Lebanon	1,910	750	1,800	1,810	60	6,330	5,727
Turkey	2,980	1,770	2,310	350	370	7,780	7,162
Total	**9,561**	**5,668**	**10,542**	**34,700**	**673**	**61,144**	**57,145**
OTHER ASIA							
Burma	600	300	300	200	60	1,460	1,710
Ceylon	1,100	600	1,200	2,600	50	5,550	6,207
Formosa	900	400	1,000	900	60	3,260	0
India	8,200	10,000	5,850	6,200	1,050	31,300	29,520
Indo-China	3,000	380	600	700	150	4,830	4,367
Japan	15,100	2,990	7,700	33,700	2,400	61,890	50,291
Malaya	3,050	300	5,780	12,990	150	22,270	19,850
Pakistan	1,600	1,400	1,600	4,500	200	9,300	9,620
Thailand	1,700	650	1,400	500	120	4,370	3,350
Total	**35,250**	**17,020**	**25,430**	**62,290**	**4,240**	**144,230**	**124,915**
AFRICA							
Algeria	2,180	600	2,100	5,400	140	10,420	10,074
Angola	340	40	200	60	30	670	469
Belgian Congo	1,450	220	900	20	130	2,720	0
Cameroons, French	400	100	100*	N.A.	20	620	0
Egypt	2,850	6,160	▫ 4,300	▫ 19,500	250	33,060	29,878
Ethiopia	330	50	60	20	30	490	540
Kenya	850	300	3,500*	N.A.	50	4,700	0
Liberia	170	60	40	—	5	275	0
Madagascar	400	95	160	30	40	725	689
Morocco, French	3,030	439	1,000	1,650	133	6,252	6,205
Nigeria	1,500	400	300	100	50	2,350	0
Rhodesia	1,517	291	500*	N.A.	100	2,408	0
Sudan	550	130	330	650	30	1,690	1,706
Tanganyika	450	150	460*	N.A.	30	1,090	0
Tunisia	1,293	277	690	1,372	51	3,683	2,613
Uganda	390	130	180*	N.A.	30	730	0
Un. South Africa	10,900	3,950	3,600	2,750	750	21,950	19,920
Cape Verde	0	0	0	0	0	0	3,102
Total	**28,600**	**13,392**	**18,420**	**31,552**	**1,869**	**93,833**	**72,094**
OCEANIA							
Australia	24,181	3,688	7,950	8,995	1,295	46,109	40,806
Indonesia	4,600	4,661	4,018	4,755	220	18,254	17,280
New Zealand	6,070	190	1,910	2,070	210	10,450	9,526
Philippine Is.	4,600	1,420	2,810	3,350	270	12,450	12,080
Total	**39,451**	**9,959**	**16,688**	**19,170**	**1,995**	**87,263**	**79,692**
TOTAL ABOVE COUNTRIES	**1,706,851**	**230,984**	**858,935**	**1,156,848**	**70,874**	**4,024,492**	**3,844,048**
Daily Average	**4,676**	**633**	**2,353**	**3,169**	**194**	**11,025**	**10,352**

▫ Includes transit trade in ship bunkers.

* Includes any residual fuel, quantities not available.

in the world's markets thus had to be made for 266,700 b/d of new oil.

Outside of Iran the largest gain in output was reported by Kuwait where production averaged about 1,106,000 b/d compared with 955,800 b/d in 1954. Iraq fields increased their yield 53,300 b/d to 682,000 b/d. Saudi Arabian output rose only 11,500 b/d to 964,100 b/d. Qatar was up 9,300 b/d to 114,200 b/d.

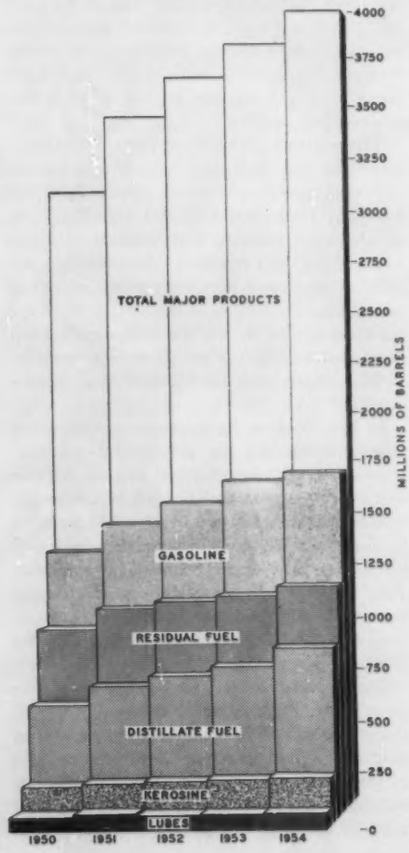
Indonesia had an increase in production of about 10 percent to 239,500 b/d and British Borneo output was up eight percent to 106,500 b/d.

In the western hemisphere Venezuela was enabled to show a good increase in production as a result of an excellent fuel oil market. Early in the year the United States provided a rising demand for industrial fuels. Later in the year the shortage of coal in Britain caused a substantial conversion from solid to liquid fuels and a larger inflow of heavy oils from the Caribbean.

At no time during the year did Venezuelan output fall below two million barrels daily. Third quarter production averaged 2,151,300 b/d and it is estimated that the normal fourth quarter rise in fuel demand brought average production to about 2,236,000 b/d.

(*Continued on page* 81)

World Demand for Major Products



The Heletz discovery well in Israel has been tested at 300 to 420 b/d, depending on the size choke used, producing from the second pay zone. The production rate of the first pay zone has not been tested. Two step-out wells are now being drilled from the discovery and a wave of increased drilling activity has been set off among other independents exploring in Israel.

Oil spurts for the first time in Israel upon dismantling of the drill stem at Heletz on Sept. 22.

420 b/d PRODUCER IN ISRAEL

THE Heletz well, formerly known as Huleiqat, is located on the coastal plain about 34 miles south of Tel Aviv and seven miles from the Mediterranean coast. It is situated on a seismic high which is superimposed on a gravity maximum. This maximum pertains to a trend of positive anomalies which extend over a length of about 36 miles from the Sinai of Egypt along the Gaza strip to about nine miles northeast of Heletz #1, lying 18 to 25 miles west of the Hebron mountains.

The surface geology of this whole coastal area is masked by Pleistocene sands which form topographic ridges on and along the gravity trend. All these principal anomalies, covering some 130,000 acres, are held by Lapidoth Israel Petroleum Co., which is owned 30 percent by American Israel Petroleum Corp., New York, and Israel Oil Prospectors Corp. Ltd., a company composed of Solel Boneh, Federmann, Swiss and American investors.

The name of Huleiqat was given this well by Iraq Petroleum Co., which began the well in 1947. IPC found the first objective of the well, the Cenomanian dolomites, waterlogged and the Lower Cretaceous showed calcareous non-sandy facies down to a depth of 3,464 feet where the well was abandoned.

The abandonment was less because for geological reasons than for political considerations, since growing unrest in what was then Palestine was coming to a head with the pending British termination of their Mandate-an event which occurred on May 14, 1948 to be followed immediately by the Arab-Israeli war. Before abandoning the well, 11¾ inch casing was set down to the bottom. This permitted Lapidoth and Israel Oil Prospectors to deepen the same hole later.

In 1954 these companies had drilled a wildcat to 11,965 feet near Beeri, which is located on the southern half of the gravity trend 14½ miles southwest of Heltez #1, without encountering any sands or shows worth mentioning. On the other hand, the Tel Safit well, drilled by Pan Israel Oil Co., Inc., 14½ miles northeast of Heletz #1, penetrated a Lower Cretaceous section which consisted of a calcareous upper portion and a shaly-sandy lower portion. Although the sands at Tel Safit had given no indication of oil, they were considered as an attractive objective if extending sufficiently westwards to reach the Heletz area.

Data on IPC's refraction-seismic survey were not available to Lapidoth-Israel. During the last two years, however, the geophysical division of Weizmann Institute has carried out several reflection and refraction seismic sections across the area. Their results clearly indicated a relatively steep outer west flank, but were rather inconclusive in the crestal area and along the east flank of the gravity maximum.

Finally with the help of a few core holes, Lapidoth and IOP obtained enough evidence to indicate that the Huleiqat wildcat had been located on or near the crest of the structure.

Deepening of Heletz #1 began on Aug. 26, 1955 with the drilling through of the bottom plug in the 11¾ inch casing at 3,464 feet. The predominantly calcareous portion of the Lower Cretaceous, which according to IPC's log had been entered at 2,114 feet, continued in the same facies down to 4,383 feet. Here the shaly-sandy portion of the Lower Cretaceous of Tel Safit was reached. From 4,383 feet to the present bottom of Heletz #1 at 4,971 feet five sands were logged. The upper three sands, 16 feet, six feet and seven feet respectively, showed porosities of 11-22 percent and a water saturation of 70-86 percent without any oil residue. The water contained was salt.

The fourth sand, encountered at 4,906 feet, is six feet thick and oil saturated. Sidewall cores indicated porosities of 18.7 to 21.1 percent and permeabilities of 60 to 98 md. A drillsteam test, with the tool open through a ¼ inch choke during one and one-half hours, resulted in about 70 barrels of oil in the pipe, or about 44 b/d. When still contaminated with drilling fluid the oil had a specific gravity of .8858 at 15° centigrade, corresponding to API Rating of about 28.1 and a total sulfur content of 1.63 percent.

The fifth sand is at 4,946 feet and is about 18 feet thick, oil saturated throughout. Part of the sand was cored, but only a few pieces of harder streaks were recovered. According to core analysis of such a partly cemented sand, its porosity is only 9.1 percent, permeability 76 md, and water saturation 16.5 percent. The drillstem test on November 25 showed a production of 420 b/d from this sand, from a $\frac{5}{16}$ inch choke. Top pressure was 128 psi. The gas/oil ratio was 104:1. Oil from this layer had a specific gravity of .8763 at 15° centigrade and a sulfur content of 1.51 percent, on initial tests. Later reports placed the gravity at 32.5 API with the same sulfur content. Bottom hole pressure is 1,862 psi. at 4,900 feet, and temperature 140° F. This sand rests on oil impregnated dolomite and coralliferous limestone of which only two feet has been penetrated above the present bottom of the hole. More and thicker sands are expected deeper down.

Seven inch casing has been set below the fourth sand at 4,940 feet. Two new stepout tests are underway across the longitudinal axis of the structure, 1,200 feet southeast and 1,200 feet northwest of the discovery.

The Heletz discovery is the result of an effort in which nearly a dozen wildcat wells have been drilled since 1952 (*World Petroleum, September 1955*). In that year Petroleum Law 5712-1952 was passed, designed to encourage the participation of foreign investors. A depletion allowance was not included in its provisions, however it was understood that this would become effective at a later date. Since production has only recently been discovered no urgency existed as regards its passage, however the allowance has been completed in form substantially corresponding to that in the United States or 27½ percent of gross to 50 percent of net income deduction. It is contained under the provisions of the Income Tax Ordinance of 1947, Regulations Concerning Deductions for Holders of Petroleum Interests, and will be published shortly. As a regulation, it does not require the approval of the Knesset, or Legislature, as would a law.

the jet fuel problem

- *U. S. airlines alone have ordered 150 transport jets and 135 turboprops.*
- *New jet engines consume 480 to 615 gallons per hour.*
- *The DC-8 will require 13,000 gallons of fuel for an Atlantic crossing.*
- *Some turboprop operators are demanding kerosine as fuel.*
- *Airport fuel facilities must be revised for rapid jet servicing.*

The Douglas DC-8, for which orders have been placed by a number of U.S. and European airlines.

WELL over half a billion dollars in orders have been placed with West Coast airplane manufacturers since last October—orders for jet transports to be used by the commercial airlines. With dramatic suddenness the indecision with regard to jets has ended. This indecision has plagued the management of the world's major airlines ever since the British put the first jet transport, the Comet, in service in May 1952. Now it is a thing of the past, buried under an avalanche of orders that was touched off by Pan American World Airways announcing it had contracted for 45 American-built jets to be delivered in December 1958.

No sooner had Pan American taken this step than other airlines, realizing that preferential delivery position is now the overriding factor, hastened to the West Coast to get their orders on the books. Pan American, it should be pointed out, split its order between two companies, Boeing in Seattle and Douglas in Santa Monica. Boeing is offering a commercial version of its Model 707 tanker-transport that it is now producing for the United States Air Force, while Douglas is offering the DC-8 it has had in the design stage for several years. The latter airplane will be offered in two versions, a version for domestic use and an extra long range version for overseas operators. It is this latter version that Pan American has ordered. Following Pan American's lead came United with an order to Douglas for 30 of the domestic versions of the DC-9; National Airlines with an order for six DC-8's (domestic version); Eastern Air Lines with an order for 26 DC-8's; American Airlines, which went to Boeing for 30 Model 707's; KLM with an order for eight DC-8's; and Braniff, which ordered five Boeing Model 707's. This makes a total of 150 aircraft, each of which is to cost in excess of $5,000,000.

Other American and foreign carriers too are making plans to place substantial orders. Among these are such international airlines as Swissair, Scandi-

American Airlines has purchased 30 model 707 turbo-jet aircraft from the Boeing Airplane Co. at a cost of $135,000,000. American's jets will span the continent from Los Angeles to New York in four hours, 15 minutes, beginning in 1959.

navian Airlines and Japan Airlines. The total orders for the new type equipment, including, of course, the turboprop transports like the Vickers Viscount and the Lockheed Electra, of which 135 are on order by American carriers, are estimated to be worth over $7 billion to the manufacturers.

Insofar as the jet transport is concerned there appears to be little foreign competition at this time. It is true that the British expect to begin delivery of 20 Comet IV's to BOAC in the latter part of 1958, but this airplane will command a limited market because performance-wise it cannot compare with the new American transports. Air France, in addition to probably ordering ten or so American jets, has ordered a number of French-built Caravelles, but the Caravelle cannot be considered as a serious competitor for the 707 or DC-8.

The engines to be used in the American transports are to be built by Pratt and Whitney, which has an outstanding reputation for both reciprocating and turbine powerplants. The 707 and the domestic version of the DC-8 will use the more powerful J75. Most of the detail specifications of these engines are still under military security since both of them were designed for the United States Air Force for use in high performance fighters and bombers. The J57, for example, is the powerplant in the new intercontinental bomber, the Boeing B-52. In fact, the Pentagon has indicated in a recent policy announcement that release of complete information on these engines to commercial operators may not be for three or four years, a policy that if adhered to could delay for a year or more the introduction of American jet transports.

However, insofar as the J57 is concerned, it is known to develop 13,000 or more pounds thrust under take-off conditions. It is an especially rugged engine and has performed exceptionally well in military service. From an engineering point of view, it is an advanced design using a three-stage axial flow turbine to drive a 16-stage, twin-spool compressor having a compression ratio of 12 to 1. Its specific fuel consumption of 0.8 pound per pound of thrust per hour is low by comparison with other engines as its frontal area of 8.7 square feet.

Actual flight experience with the Boeing 707 shows that the J57 engine uses about 4,000 lbs. or 615 gallons of fuel per hour. This, however, was between Washington, D.C., and Seattle, Washington, against prevailing winds and it can be expected that fuel consumption will be less on eastbound flights, which usually have the benefit of a tailwind. Pan American, for example, is estimating that each engine in the DC-8—and it should be remembered that these engines are the more advanced J75 engines —will consume approximately 3,100 lbs. or 480 gallons an hour on flights from New York to Paris. By reciprocating engine standards, these rates of fuel consumption are high, and the fuel capacity of the jet transports will be correspondingly large.

Overseas versions of the DC-8 will have tanks for 18,538 gallons, while the domestic versions will carry 13,300 gallons. The Boeing 707 has a fuel capacity of 16,848 gallons. These capacities are of particular interest to marketers of aviation fuel who will be called on the provide the fueling equipment for these transports. For example, on a non-stop transcontinental flight the Boeing Model 707 consumed 10,000 gallons of fuel. A truck having a pumping rate of 200 gallons a minute would take 50 minutes to service this aircraft.

According to Pan American's estimates, the DC-8 will consume in the neighborhood of 13,000 gallons in trans-Atlantic service. This quantity of fuel exceeds the capacity of two of the largest trucks, and since these trucks are close to weight limitations it will not be practical to increase their size and it will probably require three trucks to service one of these aircraft. Even if pumping rates are increased, the number of trucks cannot be reduced because the quick turn-around time for the jets will seldom permit fuel trucks to take time for loading during the fueling operation. As a matter of fact, the airlines are calling for refueling of their jets in 20 minutes. It seems that this requirement could only be met by some form of hydrant refueling system similar to the modern system installed by Standard of California at San Francisco International Airport.

There is another and more serious problem facing both the supplier and consumer, and that is the type of fuel to be used. The jet engines in military service use JP-4, a broad cut made up of low octane gasolines and light distillates. It might therefore be concluded that the commercial operators would draw on the experience of the services and use the same fuel which is already being produced in large quantities. In 1955, for example, the military procurement of jet fuel amounted to 30 percent of the petroleum products purchased by the military, or 63,600,000 barrels. There are many reasons which have made this apparently simple, solution a debatable subject in both the petroleum and aviation industry.

The issues involved are most clearly defined in the case of two airline operators who are flying turbine-powered equipment in the United States and Canada. The aircraft they are flying, the British-made Vickers Viscount, are not jets but they employ turbines to drive their propellers and these engines have the same fuel problems as the pure jet. Trans-Canada Air Lines was the first airline to put these aircraft in service in North America and before the end of 1956 it will have 25 Viscounts on its routes. Capital Airlines, the second carrier, with routes extending from the East Coast to Minneapolis and New Orleans, will eventually have 60 Viscounts in service. Both of these carriers are enthusiastic in their approval of their new equipment, but they hold highly divergent views on the subject of the type of fuel to use.

Trans-Canada chose to use the military JP-4 type fuel even though the Dart en-

The Vickers Viscount propeller-turbine aircraft, now being flown by Trans-Canada Air Lines and Capital Air Lines.

gines in its Viscounts were designed around the British kerosine-type jet fuel that meets British Specification D. Eng. RD.2482. The deciding factor in TCA's choice was the minus 76° F. freezing point of the military blend compared with the minus 40° F. freezing point of British fuel. In TCA's case, the lower freezing point of the JP-4 was regarded as a safety factor because its airplanes operate across the prairie provinces where some of the lowest temperatures in North America are encountered. Other factors that TCA considered were the higher Btu's per pound for JP-4, 18,875 as compared with 18,550 for the kerosine available. This difference in heat content, TCA estimated, would permit their Viscounts to carry 140 pounds more payload on the Toronto to New York run. With regard to the relative cost of the two fuels, Paul E. Lamoureaux of TCA made the following statement in a paper, "Commercial Turbine Fuels—an Approach to their Selection," that he presented before the Society of Automotive Engineers:

"Although the decision to use JP-4 was made on the basis of the safety and operational factors just mentioned and before comparative prices had been obtained, it was found that aviation kerosine would cost TCA an average of 1.5 cents per Imperial gallon (range 1 to 4¢) more than JP-4. The actual cost differential for the entire Viscount service would be $190,000 per year more to purchase kerosine for 15 Viscounts than to purchase JP-4."

While these considerations were applicable to TCA's operation, Capital had equally compelling reasons for its choice of a kerosine-type fuel. Capital did not find it necessary to give so much weight to the freezing point of the fuel it selected because its airplanes are not exposed to such extremes of cold as TCA's. All its requirements are obtained from one supplier, Shell, and Shell was able to manufacture and deliver into Capital's storage its 640 Turbine Fuel with a minimum of rearrangement of its supply facilities. This was accomplished by changing slightly the specifications of the kerosine it supplies to the tractor and space-heater market so that existing facilities could handle the one grade for aviation and commercial uses. Undoubtedly this overcame the greatest single factor in supplying a new grade of fuel to the aviation industry and resulted in a very favorable price for Capital. Capital, of course, has had to provide on the field storage, but this would have been the case in any event. Imperial Oil Co. Ltd., which supplies part of TCA's JP-4 requirements, has had to make a considerable investment in storage facilities has financed new storage facilities for TCA.

The question that is fundamental to the whole problem is the question of availability. A long time ago, the military services reached the conclusion that in the case of an all-out emergency the available supply of kerosine would be insufficient to meet the demand. It was primarily for this reason that JP-4 was devised, for it permits up to 40 percent of a barrel of crude to be converted into jet fuel.

The new Piasecki Turbo Transporter, powered by gas turbine engines, can transport 40 troops at a speed of approximately 150 m.p.h. The ship uses two YT-38-A-3 turbine engines made by Allison. This is similar to the engine used in Lockheed Electra.

At the present time, the supplies of kerosine appear to be adequate to meet not only the current demand but also the estimated requirements of the aircraft industry. It is the picture ten years from now that leads to differences of opinion among the experts. There are those who feel that kerosine can meet the demands of the aviation industry in 1965 and there are others, like TCA, who feel that the non-aircraft uses will increase and put a premium on this fuel that will exclude it from the aviation market. These points of view, of course, are being thoroughly explored by the aviation industry. In the meantime, shrewd airline executives like Captain Eddie Rickenbacker of Eastern, are insisting that the engines scheduled to go in their new transports be designed to use either kerosine or JP-4.

All the reports and discussions of the airlines' orders for turbine-powered transports tend to obscure the very important fact that the conventional reciprocating engine transport is still very much with us. And orders on the books for future deliveries are still at an all-time high, with delivery dates running well into 1958. Every month sees the backlog of orders for these transports being added to, and on the other end of the scale transports like the DC-3 and DC-4 are commanding prices that are at least twice what they cost originally. Private aviation must also be taken into consideration in assessing the future trend of aviation fuels, and here we find a fleet of almost 60,000 airplanes in the United States alone. The number of miles flown by the private owners exceeds by many times the number flown by the commercial airlines. Then, of course, there is the requirement of the military services for aviation gasoline.

The military services are particularly concerned about future supplies of aviation gasoline. General Thomas D. White, Vice Chief of Staff, USAF, took occasion to voice the concern of the Air Force in a speech he gave at the open-house ceremonies dedicating the new research facilities of Universal Oil Products Co. He urged the oil industry to push the manufacture of alkylate, for this will be the main bottleneck in the production of the high performance fuels needed by the military.

"Our procurement of aviation gasoline of 100 octane or less has been going down steadily," he said. "At the same time the amount of jet fuel we have been purchasing has been going up steadily at a rate of about 20 percent a year.

"In spite of the increased use of jet engines, our demands for high octane aviation gasoline have continued to rise. We expect that we will continue to buy high octane fuel at a high rate for the next several years.

"Actually, we have trouble getting as much of the best grade gasoline as we want. The better the gasoline the better the performance of our piston engines—and we have many piston engine airplanes. The bulk of our transports and our tankers will be piston powered planes for a long time."

Atlantic Refining Co. is operating a new and unique ammonia plant using by-product hydrogen from a catalytic reformer as a source of hydrogen. Unusual purity of synthesis gas permits operation at pressures below 3,000 psig without purging of inerts.

AMMONIA FROM CATFORMER TAIL GAS

By J. H. Arnold and W. T. Dixon

William T. Dixon is manager of the design division of the engineering and construction department of The Atlantic Refining Co. In this capacity he represented Atlantic in supervising the engineering design for the catalytic reformer and ammonia plant mentioned in this article. Mr. Dixon started with Atlantic in 1927 and, prior to his present position, served in the research and development department for more than 20 years.

John H. Arnold was one of the organizers of Hydrocarbon Research, Inc., and was vice president and a director until September 1954 when he resigned to enter the consulting field. He was active during World War II as director of research and development for the Kellex Corp. in which capacity he was in charge of the design of special equipment for the Oak Ridge gaseous diffusion plant.

A new 100 ton per day anhydrous ammonia plant has been in operation at the Philadelphia refinery of the Atlantic Refining Co. for about one and one half years. It is the first ammonia plant to use the hydrogen rich by-product gas from a catalytic naphtha reformer as a source of hydrogen. The plant was designed and constructed by Hydrocarbon Research, Inc., of New York.

The plant is designed to produce a single primary product, anhydrous ammonia, at a nominal rate of 100 tons per day. The plant also recovers propane and heavier hydrocarbons from the by-product gas as a liquefied steam, and the lighter hydrocarbons as fuel gas.

The gas used as a source of hydrogen comes from an Atlantic Catformer, a catalytic reforming process developed by the Atlantic Refining Company to produce high octane gasoline from low grade naphthas. The two Catformer gas analyses shown in Table I were used as bases for design of the ammonia plant. The actual Catformer gas generally has been richer in hydrogen than Case A analysis. With this feed, the production rate has gone well over 100 tons per day. At other times the plant has operated on gases which approach the lower hydrogen analysis of Case B, Table I.

A simplified flow sheet of the plant is shown in Figure 1.

The process equipment is divided into three main functional groups: the nitrogen separation plant, the hydrogen purification plant, and the ammonia synthesis and recovery plant.

The plant purifies the hydrogen from the Catformer by refrigeration followed by washing with liquefied nitrogen at low temperature. The nitrogen required for washing the hydrogen and for synthesis of ammonia is separated from air by liquefaction and distillation at low temperature. The synthesis of ammonia from the mixture of hydrogen and nitrogen is effected at a relatively low pressure over a typical doubly promoted iron catalyst. The ammonia product is liquefied by cooling the synthesis reactor effluent in two stages, to 100°F. using water, and to 25°F. using ammonia refrigeration. The liquefied ammonia product flows directly from the recovery system to the product storage spheres.

TABLE I

Hydrogen-Rich Stream	*Plant Feed Approximate Compositions*	
	Case A	*Case B*
Flow Rate	8,000,000 SCFD	8,000,000 SCFD
Conponent		
H_2S	10 grains/100 cf	10 grains/100 cf
H_2	95.0 mol%	86.6 mol%
CH_4	0.6	3.2
C_2H_6	0.6	2.5
C_3H_8	1.9	4.6
iC_4H_{10}	0.7	1.2
nC_4H_{10}	0.5	0.9
iC_5H_{12}	0.2	0.4
nC_5H_{12}	0.1	0.2
C_6+	0.4	0.4
	100.0	100.0

The only pieces of major equipment provided in duplicate are the acetylene adsorbers, and the Catformer gas driers. The feed air compressor of the nitrogen separation plant and the recycle gas circulating compressor of the ammonia synthesis plant are each single units. Other large compressors are each provided as two half size units. No spare cold equipment is provided for deriming the exchangers in the hydrogen separation plant nor are these operated on a switch basis. There is a single ammonia synthesis converter and a single ammonia recovery system including a single high pressure separator.

The compressors which consume the bulk of the power required to operate the plant are driven by electric motors. The larger compressors are driven by unity power factor synchronous motors since this type of load best suits the overall refinery power balance. The total electrical load is approxi-

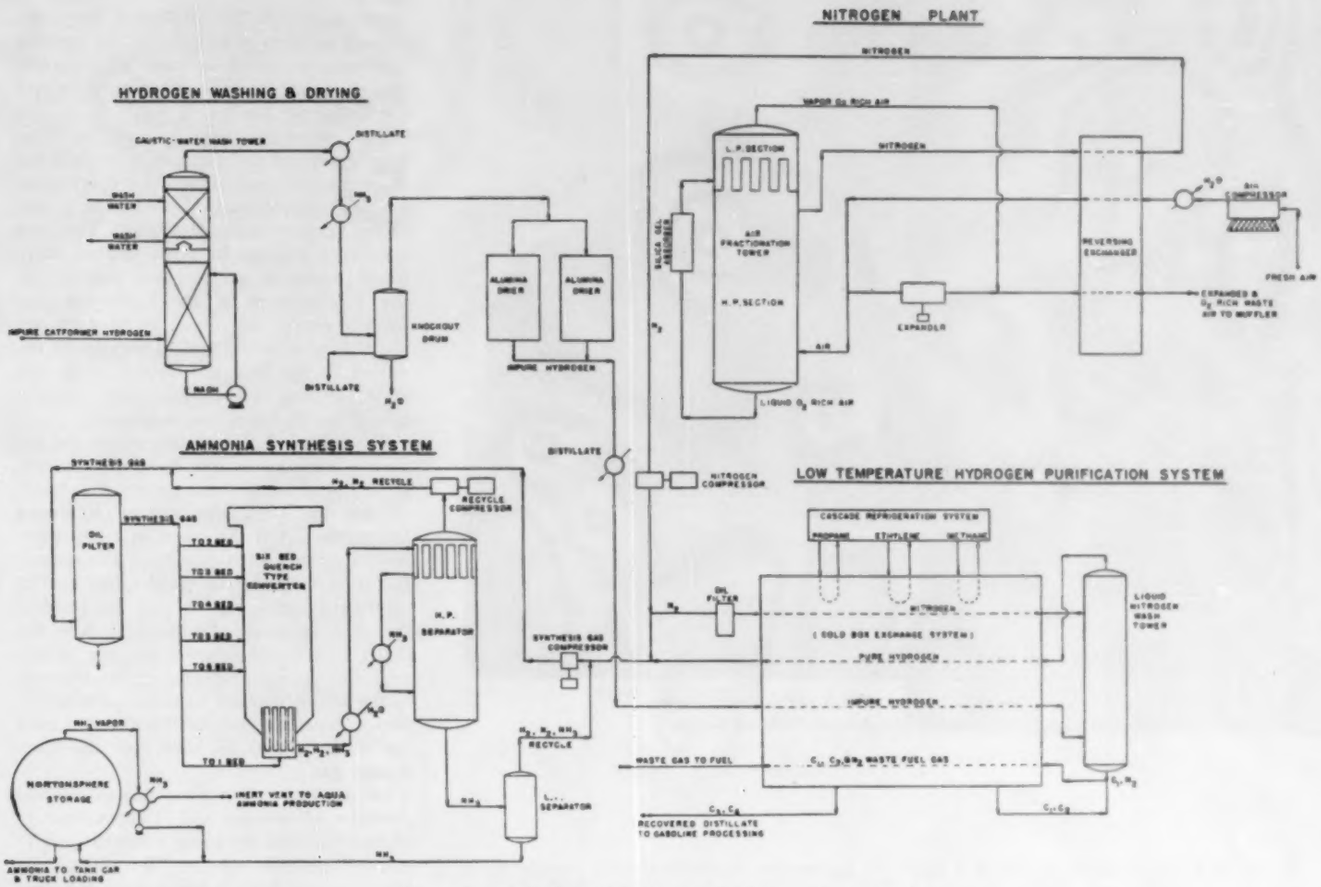


Figure 1. Simplified flow sheet of Atlantic's ammonia plant.

mately 4000 kilowatts. The steam requirement is under 2500 lb/hr and the circulating cooling water rate is under 4000 gpm.

The plant is situated on a plot 176 feet by 274 feet. There are two buildings; the larger building houses the compressors and some of the associated intercoolers, aftercoolers, and drums. The smaller building is the control house which shelters the principal control instruments and synthesis converter valve operators. All other equipment is located outdoors.

The air to be liquefied and fractionated in the nitrogen separation plant is drawn from the atmosphere immediately outside the compressor house. It is filtered and then compressed to approximately 80 psig in a seven stage diaphragm cooled centrifugal compressor driven through a gear by a synchronous motor. The compressed air is cooled in a conventional water cooled tube and shell exchanger and the water condensate is separated in a vertical drum which also acts as a surge drum. Reversing exchangers are used to further cool the compressed air to essentially its liquefaction temperature and to remove the residual water and the carbon dioxide.

The reversing exchanger assembly consists of a number of brazed aluminum extended surface heat exchanger units. The exchangers are manifolded into batteries, each battery consisting of three exchanger units in parallel and two exchanger units in series. Each battery is mounted vertically and the corresponding stream connections of the individual exchanger units are manifolded at top and bottom.

Each exchanger unit has a cross section of 17 inches by 20⅞ inches and a length of 106½ inches. There are 50 individual passes per exchanger which are divided between the streams exchanging heat in accordance with the heat transfer requirements. Each pass has 15 fins per inch of width running the length of the pass. The fins are 0.375 inch tall and 0.008 inch thick and they are both corrugated and serrated.

The chilled compressed air is liquefied and distilled in a fractional distillation column at approximately 68 psig into a high purity gaseous nitrogen stream overhead and an oxygen enriched liquid bottoms. The liquid bottoms are subcooled external to the tower, passed through silica gel to remove traces of acetylene and then expanded into a condenser-evaporator at the top of the distillation tower. The expanded liquid vaporizes completely in the condenser-evaporator, thereby condensing nitrogen reflux at the top of the distillation tower.

The distillation column has an internal diameter of 54 inches and is approximately 34 feet tall. The shell and heads are fabricated of stainless steel and the trays, bubble caps, and down comers are of aluminum. The tray spacing is four inches and the tray seals are specially designed to avoid bypassing of the trays by even minute quantities of gas which adversely affects the purity of the product. The condenser-evaporator at the top of the tower consists of light drawn copper tubes rolled into stainless steel tube sheets.

The nitrogen product from the top of the distillation column and the waste stream from the condenser-evaporator both flow back out the reversing exchanger, thereby chilling the incoming compressed air. Every 15 minutes the flow of compressed air and of waste gas through the reversing exchanger is reversed, i.e., the compressed air is caused to flow through the passes previously carrying waste gas and the waste gas is caused to flow through the passes previously carrying compressed air. In this manner the residual water and carbon dioxide deposited from the compressed air during one half cycle are revaporized into the waste gas and carried out of the exchanger during the next half cycle. The high purity nitrogen flows through the special nonreversing passes of the reversing exchanger to prevent contamination with air or waste gases.

The refrigeration requirement of the nitrogen separation plant is supplied by expanding chilled air from approximately

Compressor house and storage spheres of the new 100 ton per day anhydrous ammonia plant at the Philadelphia refinery of The Atlantic Refining Co.

72 psig and minus 245°F. to about 4 psig and minus 370°F. The air is expanded through a single stage turbo-expander turning at a speed of 25,000 rpm. The single turbine wheel is five inches in diameter and it is directly connected by a single shaft to a two stage oil pump. The first stage is a jet pump used primarily to force lubricant through the bearings. The second stage is a single impeller used primarily to absorb power. The single shaft is less than 12 inches long. Power is generated at one end at temperatures well below minus 200°F. and absorbed at the other end at temperatures above plus 100°F. The combined turbine and pump assembly is about 30 inches long, 10 inches in diameter, weighs less than 50 pounds and is capable of developing and absorbing over 40 hp.

All equipment of the nitrogen separation plant is enclosed in a rectangular box made of structural steel with sheet steel sidings. The space within the box not occupied by equipment is packed with mineral wool. Bonnets of all operating valves extend through the cold box wall so that the valves can be repacked without entering the cold box. Conventional instruments are used throughout with essentially all the working parts mounted external to the cold box.

Essentially all of the equipment inside the cold box, exclusive of the condenser-evaporator tubes, is either stainless steel or aluminum. The choice between one or the other material was based chiefly on the relative costs. Special transition joints similar to Van Stone flanges are used for connections between aluminum and stainless steel.

The Catformer gas arrives at the ammonia plant at ambient temperature at approximately 400 psig. All Catformer gas arriving at the ammonia plant is processed as received. It is first processed to remove hydrogen sulfide and water vapor which would otherwise solidify in the cold exchangers of the hydrogen separation plant. The hydrogen sulfide is removed from the gas by caustic washing in the lower section of a double tower and any caustic entrainment is removed by water washing in the upper section of the same tower. The hydrogen sulfide free gas is then partially dried by refrigerating to 50°F. and further dried over activated alumina to a dew point of minus 80°F.

The hydrogen sulfide and water free gas is then cooled in a series of brazed aluminum extended surface exchangers and washed with liquid nitrogen. Hydrocarbons condensing from the gas as it is chilled prior to the nitrogen wash are removed from the gas in four separators at four temperature levels. The liquids from the first two separators are blended to form the by-product liquid mixture of propane and higher hydrocarbons. The liquids from the last two separators are evaporated into the by-product fuel gas.

The nitrogen leaving the nitrogen separation plant is boosted to about 400 psig in two stages of a multicylinder reciprocating compressor directly coupled to a synchronous motor. The portion of the compressed nitrogen to be liquefied for washing hydrogen is cooled in some of the same brazed aluminum exchangers used to cool the Catformer gas.

The exchangers used to cool the Catformer gas and the nitrogen to be liquefied are similar in construction to the reversing exchangers previously described as a part of the nitrogen separation plant. They are somewhat smaller in cross section, have fewer passes and are designed to withstand the full pressure of the Catformer gas. Twenty-seven individual exchangers are manifolded in series and in parallel as required by the flow and duty of each step of the cooling and multiple stage separation of the hydrocrabon condensates.

The chilled Catformer gas enters the nitrogen wash tower just below the bottom tray. Liquefied nitrogen enters the tower on the top tray. The washed hydrogen leaves the top of the tower as a vapor essentially free of hydrocarbons and oxygen but containing about 10% of nitrogen. The condensed hydrocarbons and the residual liquefied nitrogen leave the bottom of the tower as a liquid mixture and are vaporized into the by-product fuel gas external to the tower, thereby furnishing refrigeration to liquefy a part of the nitrogen used for washing and to help cool the Catformer gas.

The nitrogen wash tower has an internal diameter of two feet and is approximately 28 feet tall. The shell and heads are fabricated of stainless steel and the trays, bubble caps and down comers are aluminum. The tray spacing is eight inches and tray seals, like the tray seals of the nitrogen separation tower, are specially designed to avoid bypassing of the trays by even minute quantities of gas which would adversely affect the purity of the product.

A cascade refrigeration system provides the net refrigeration requirement for cooling the Catformer gas, condensing the hydrocarbons from the Catformer gas, and cooling and liquefying the nitrogen used for washing. The steps of the cascade are propane, ethylene, and methane. Each refrigerant is compressed in two stages using two cylinders of a six cylinder reciprocating compressor directly driven by a synchronous motor. A single 450 hp machine handles all three services. Two identical 450 hp machines are provided, each designed for one half total load. Thus when operating on Case A feed, one machine can be shut down. Each refrigerant is vaporized at a slight positive pressure. Refrigeration is utilized at all three temperature levels. Refrigeration at the propane and ethylene levels is utilized principally to condense hydrocarbons from the Catformer gas. Refrigeration is utilized at the methane level to liquefy nitrogen. The refrigeration output of each system is automatically controlled to meet normal fluctuations in load. Clearance pockets are also provided.

The cascade compressor cylinders are lubricated with a high grade petroleum oil and special traps are used to remove oil

entrained in the refrigerant before it enters the sub-atmospheric temperature section of the cascade.

The equipment of the hydrogen separation plant, including the refrigeration cascade, operating at sub-atmospheric temperatures, is enclosed in the same cold box which encloses the nitrogen separation equipment. The two sections are separated by an internal partition which permits access to one section without disturbing insulation in the other. Bonnets of all operating valves extend through the cold box just as they do on the nitrogen separation plant. Conventional instruments are also used with the working parts mounted external to the cold box. Essentially all the process equipment within the cold box is either stainless steel or aluminum. The compact arrangement of equipment within the cold box is illustrated by the photograph of the scale model of the cold box, Figure 2.

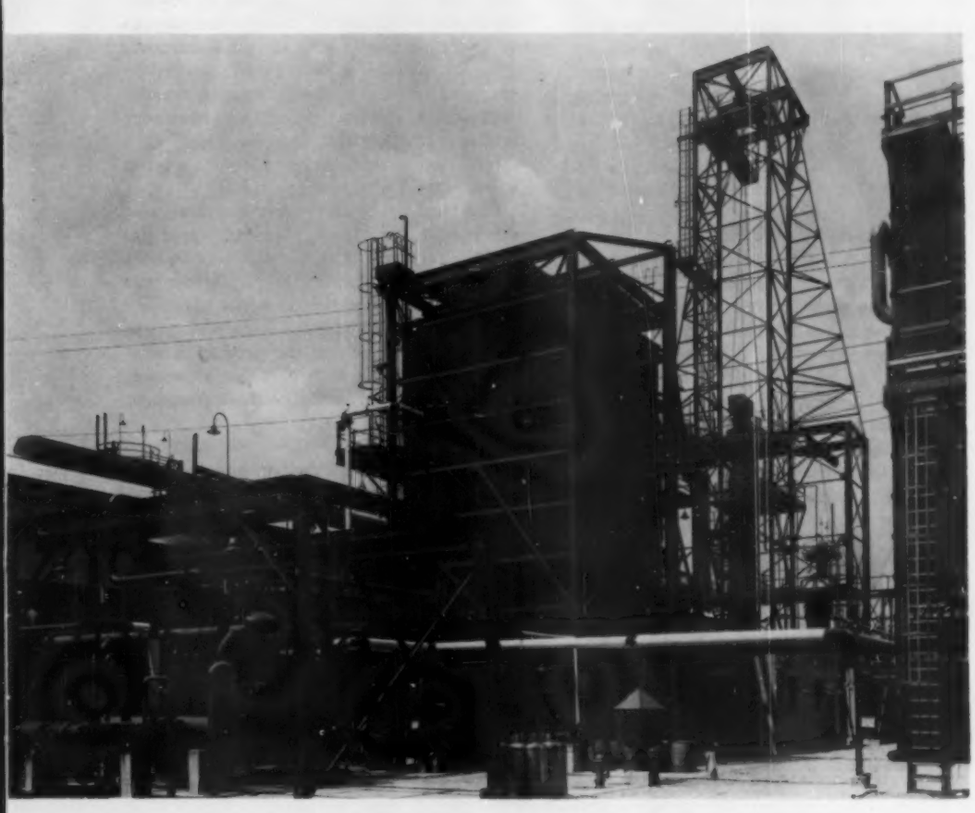
The entire output of washed hydrogen from the hydrogen separation plant plus the necessary pure nitrogen are mixed to form a 3:1 hydrogen nitrogen synthesis gas, and the mixture is further compressed in two stages in two cylinders of the multi-cylinder reciprocating compressor, the other cylinders of which are used to compress pure nitrogen to about 400 psig as previously described.

The synthesis gas does not normally contain any significant content of free oxygen or carbon monoxide. However as a precautionary measure the synthesis gas as it leaves the first stage of the compressor is heated by steam in a conventional tube and shell exchanger to approximately 400°F. and then flows through a guard chamber which contains a reduced copper nickel catalyst. Traces of free oxygen or carbon monoxide present inadvertently in the synthesis gas are converted to water vapor and methane respectively and thus the synthesis circuit is clear of free oxygen or carbon monoxide at all times.

The compressed synthesis gas joins the recycle gas from the ammonia recovery system and enters a specially designed oil filter to remove any compressor lubricating oil entrained by either the synthesis gas or the recycle gas.

The oil free mixture enters the ammonia converter. The bulk of the mixture flows through the heat exchanger located in the base of the converter where it is heated to essentially reaction temperature by the converter effluent. The preheated mixture flows up the central transfer tube of the converter and then reverses direction and flows down over the catalyst. Cold gas bypassing the heat exchanger is injected between the vertical beds of catalyst as the main gas stream flows downward over the catalyst thus tempering the reaction and spreading it out over all catalyst beds. The converter also has a multi-layer steel shell. The top and bottom heads are forgings. The multi-layer shell serves only as a pressure case for the actual converter. The converter proper has a light alloy steel shell insulated on the outside, and the cold feed gas entering the reactor first flows along the annulus between the inner wall of the pressure case and the insulated outer wall of the alloy shell, to keep the pressure case cool. There are six catalyst beds arranged in series vertically and provision is made to add cold gas between all beds which controls the temperature of the gas mixture entering and leaving each bed. The converter proper and the heat exchanger can be withdrawn

Scale model of the cold box.



Cold box and converter structure of the ammonia plant.

as a single unit through the top flange of the pressure case.

The central transfer pipe of the converter, which carries the hot effluent from the heat exchanger to the entrance to the first catalyst bed, is equipped with an electrical heater. This heater furnishes heat for the initial reduction of the catalyst and to heat the catalyst up to reaction temperation whenever the converter is started cold. The heater has a nichrome ribbon element. Single phase current is supplied to the heater with a maximum power input of 300 kva. Regulation of power input is afforded by a reactrol transformer capable of varying the voltage across the heating element from 69 volts to 220 volts. The electrical leads from outside the converter to the internal heater pass through a special pressure cast non-metallic seal, which is absolutely gas tight at pressure far exceeding the design synthesis pressure.

The effluent from the catalyst beds passes through the heat exchanger and on to the water cooler where it is cooled to about 100°F. The effluent is further cooled to about 25°F. as it flows through an exchanger counter to the cold recycle gas and then through a chiller refrigerated by evaporating ammonia. The chilled effluent then flows to a separator. The vapor from the separator, which is the recycle gas, flows back through the cold exchanger and on to the circulator to be returned to the reactor.

The circulator is a single stage reciprocating compressor direct driven by a synchronous motor. The recycle gas leaving the circulator meets the fresh feed at the entrance to the oil filter and the cycle is completed.

The condensed ammonia from the high pressure separator is flashed to approximately 400 psig in a second separator and the flashed liquid flows under its own pressure to either of two 48-foot Hortonspheres. The flashed gas flows to the suction of the synthesis gas compressor and is thus returned to the converter. No purge of inerts is necessary from the synthesis system.

The ammonia product is pumped from storage by means of multi-stage vertical pumps to racks for loading into either railway tank cars or tank trucks.

The ammonia refrigeration system used principally to condense the ammonia in the reacter effluent has two stages of compression with direct contact interstage cooling to reduce the power requirement. The compressor is direct driven by a 400 hp synchronous motor. Clearance pockets are provided to permit a 25% reduction in capacity. Manual by-pass valves are also provided. Slight variations in load are met by a compensating change in suction pressure.

The plant is designed to process 8,000,000 standard cubic feet per day of Catformer gas and to convert 97% of the hydrogen contained in the Catformer gas to ammonia in the product storage tanks.

The plant is also designed to recover a minimum of 96% of the propane and heavier hydrocarbons as a liquid product. This percentage amounts to 210-430 barrels per day for the Catformer gas analyses shown in Table I.

The nitrogen separation plant is designed so that the idle plant at ambient temperature can be brought on stream producing the full output of pure nitrogen in 48 hours. The plant is also designed so that it can be bottled up in the event the air flow is interrupted, and can be restarted cold without deriming after periods of idleness up to 6-8 hours. The plant is also designed so that it can be shut down almost instantaneously and can be warmed to ambient temperature in less than 24 hours.

The reversing exchangers are designed to trap and eliminate essentially all the residual water and carbon dioxide contained in the compressed air so that the plant can be operated indefinitely without any type of chemical clean up or predrying of the air, and without interruption of the operation to derime the reversing exchanger or other cold equipment.

The silica gel adsorbers are designed to prevent indefinitely the concentration of the acetylene from reaching a dangerous level in the condenser evaporator.

The nitrogen separation plant controls are designed so that normal fluctuations in the demand for pure nitrogen by the hydrogen separation or ammonia synthesis plants are handled at the nitrogen separation plant simply by adjustment of the pure nitrogen draw off valve. For larger changes such as those required by deliberate, substantial changes in ammonia production rate, the adjustment of the pure nitrogen can be coupled with a corresponding adjustment in the output of the feed air compressor.

The nitrogen separation plant is designed to produce a nitrogen product containing not more than 25 parts per million of oxygen.

The hydrogen separation plant is designed so that in a period of not more than 72 hours its cascade can be charged with refrigerants and the plant cooled to operating temperatures. The plant is also designed so that it can be maintained cold indefinitely using pure nitrogen in place of Catformer gas in the event the Catformer gas flow is interrupted. By this means the cold plant can be restarted after an indefinite period of idleness and be producing essentially pure hydrogen in a matter of a few hours after Catformer gas flow is re-established. The plant is also designed so that it can be shut down essentially instantaneously and can be warmed to ambient temperature in less than 24 hours.

The hydrogen separation plant is designed to run indefinitely without deriming of any equipment.

The plant controls are designed so that all the available Catformer gas flows into the plant and so that normal fluctuations in the flow of Catformer gas are handled with no adjustment of the hydrogen separation plant other than the adjustment of the refrigeration cascade to the change in load and this adjustment is mainly automatic. For larger changes such as those required by deliberate substantial changes in ammonia production rate, the automatic adjustment of the cascade is coupled with a compensating manual adjustment of the flow controller regulating the quantity of nitrogen being liquefied.

The hydrogen separation plant is designed to produce a washed hydrogen such that the 3:1 hydrogen nitrogen synthesis gas contains less than 10 ppm of oxygen and less than 100 ppm of argon and other inerts.

The high pressure synthesis equipment of the ammonia synthesis plant is designed for a maximum operating pressure of 3800 psig but the plant is designed to produce the rated production of ammonia at pressures below 3000 psig and without requiring purging the recycle of inerts.

In actual operation the plant has met and exceeded each of the design operating specifications enumerated above.

The new and unique ammonia plant, now in operation at the Philadelphia refinery of the Atlantic Refining Company, uses for the first time Catformer gas as a source of hydrogen for ammonia synthesis. The synthesis gas prepared from the Catformer gas is so pure that the small quantities of other gases which it contains are readily soluble in the liquid ammonia product leaving the 400 psig let down tank.

The two basic steps in the preparation of the synthesis gas, the fractionation of nitrogen from air and the washing of the Catformer gas with liquid nitrogen, are both carried out in a single, compact cold box. The two sections are designed to operate indefinitely without deriming. Pure oxygen is not separated from air simultaneously with the nitrogen since it is not required by the process. However, the nitrogen separation plant is designed so that the necessary additional equipment can be added at a later date should the need for pure oxygen arise.

The hydrogen separation plant is also designed to process a blend of water gas and Catformer gas should, for any reason, the necessary quantity of Catformer gas not be available to the ammonia plant.

The ammonia synthesis is carried out in a single converter and the product is separated in a single high pressure separator. The synthesis is carried out at pressures below 3000 psig.

A conversion of 97% of the hydrogen contained in the Catformer gas to a refrigeration grade liquid ammonia product is made possible by the elimination of the necessity of purging the converter recycle and by the use of a simple, pressure tight system throughout the plant.

Acknowledgement

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Combination Unit at Daura Refinery, Baghdad, Iraq. All photos with this article by Elwood M. Payne.

Major oil requirements of Iraq are supplied by the new Government Oil Refineries Administration

Daura Refinery at Baghdad

By Dr. Naxhim al-Pachachi, Ata Amin, Mohammed Al-Naquib, Ihsan Rifat[1] and Staff[2]

His Excellency Dr. Naxhim al-Pachachi

His Excellency Ata Amin

Mr. Mohammed Al-Naquib

Mr. Ihsan Rifat

THE erection of a government oil refinery has been one of the aspirations of the Iraq government since it was first instituted. The agreement between the government and the Iraq Petroleum Co. in 1931 referred to this aspiration. However, it could not be realized until 1955.

The Daura site, which in area for the equipment involved, is the largest in the world, was chosen by the government of Iraq for three reasons: its proximity to Baghdad; because the river provided easy transport; and because the water from the river could be used in the plant for cooling purposes.

Proximity to Baghdad is vital. The people of that city are the chief consumers of petroleum products in Iraq, using approximately 40 percent of the country's consumption. Also, oil destined for other parts of the country can be best distributed from Baghdad. Not least in the considerations which influenced the choice of site were its communications with the city. For three routes now carry the products of the refinery to Baghdad: An oil pipe line system, the railway and the barges on the Tigris. The pipe line of the city connects directly with the distributing center to the nation. A special jetty has been built for loading barges at the refinery.

The Baghdad refinery is unique in that it has been designed to be entirely self-supporting and independent. There are complete facilities for the maintenance of the plant, as well as a modern canning plant which enables the refinery to make, paint and label the millions of cans in which the refined products travel to every corner of the country.

The Baghdad refinery was built by Iraqi construction forces, with British engineering equipment and machinery all directed and welded together by American know-how. Long before the refinery was commissioned on June 1, 1955, a tremendous construction task had to be accomplished. To provide foundations for the process units and all the heavy equipment required in the refinery, 4,500 concrete piles were sunk, then materials and equipment of over 20,000 tons were imported.

TABLE I.

Sales of Major Petroleum Products in Iraq 1950-1954

(Thousands of Barrels)

	1950	1951	1952	1953	1954
Motor Spirit (Gasoline)	723	795	851	991	1121
Kerosine	917	963	1038	1199	1407
Gas Oil					
High Grade Diesel	255	309	399	514	653
Fuel Oil	2299	2729	2989	3290	3449
TOTAL:	4194	4796	5277	5994	6630

TABLE IV.

Comparison of Tailored and Stabilized Full Kirkuk Crude

	Tailored Kirkuk Crude	Stabilizing Full Range Kirkuk Crude
°API	30.6	36.2
Distillation:		
% Distilled @ 250°F.	4.4	12.0
% Distilled @ 300°F.	7.0	18.5
% Distilled @ 350°F.	11.5	24.0
Viscosity, centistokes at 100°F.	—	4.4
Sulfur, wt%	2.2	2.0
Reid Vapor Pressure, P.S.I.	2.0	4.5

TABLE II

Combination Unit Yields and Typical Product Inspections

	BPSD	Liquid Vol. % of Charge
Charge:		
Stabilized Full Range Kirkuk Crude	27,000	100.0
Products:		
Motor Spirit	6129	22.7
Kerosine	5643	20.9
Gas Oil	3807	14.1.
Diesel	(1)	(1)
Fuel Oil	9342	34.6
Bunker "C" Oil	1053	3.9
Gas and Loss	1026	3.8
TOTAL:	27,000	100.0

(1) Fuel Oil and Gas Oil are tank blended to make diesel oil according to market demand.

Typical Finished Product Inspections

	Motor Spirit	Kerosine	Gas Oil	Diesel Oil	Fuel Oil	Bunker "C" Oil
Gravity, °API	68.1	47.5	37.4	29.2	20.3	11.9
Distillation:						
IBP	99	284	369			
10%	126	331	446			
30%	160	354	500			
50%	199	379	530			
70%	237	414	561			
90%	288	464	604			
E.P.	338	504	644			
Flash Point, P-M, °F.		108	174	180	185	200+
Sulfur, wt%	.07	.10	1.0	2.0	3.5	4.4
Reid Vapor Pressure, PSI	8.0	—	—	—	—	—
Viscosity:						
Redwood 1 @ 100°F., Sec.	—	—	35	57	200	
Redwood 2 @ 122°F., Sec.	—	—	—	—	—	250
Pour Point, °F.	—	—	10	20	25	75
Color	—	25 (Saybolt)	2.0 MPA			
Carbon Residue, wt%	—	—	.02	2.0	8.4	11.6
Diesel Index	—	—	62	—	—	—
Octane:						
Motor	74					
Research	78					

TABLE III

Comparison of Current Sales Demand vs. Design (As Percent of Crude Charge).

	Current	Design
Motor Spirit	12.6	25.8
Kerosine	16.7	14.4
Gas Oil	9.7	8.2
Diesel	15.2	12.2
Fuel Oil	34.6	16.4
Bunker "C" Oil	0.6	15.1

More than 80 percent of the 20,000 tons of machinery, apparatus and equipment has been provided by British manufacturers, with a few specialized items originating from the United States.

This was the work of a team. Some 3,800 Iraqis were sought to form a giant labor force under the guidance of key British and American technical experts. Hundreds of Iraqis had to be trained as welders, men who previously had no experience with mechanical tools. The training program was a great success. The Iraqis showed particular skill which enabled them to pass tests in a very short time.

Wherever possible, the maximum use was made of Iraqi materials, including two million specially made bricks, and the cement used for foundations and roads all came from local sources.

A combination unit was selected for this refinery to minimize costs. In this unit, the operations of crude distillation, vis-breaking, cracking, reforming and vacuum flashing are carried out in a single integrated plant. Very considerable savings are effected in comparison with conventional plants. There is a lower capital cost, reduced labor costs and a considerable saving in fuel, electric power, steam and water. Labor costs are cut because of the high degree of automatic instrumentation incorporated in the design.

Design and construction was by the M. W. Kellogg Co., concrete work was by D. & C. and William Press Co. Ltd., civil engineering was by Maunsel, Posford, Pavery Co., and power plant engineering by Cyanamid Products Ltd.

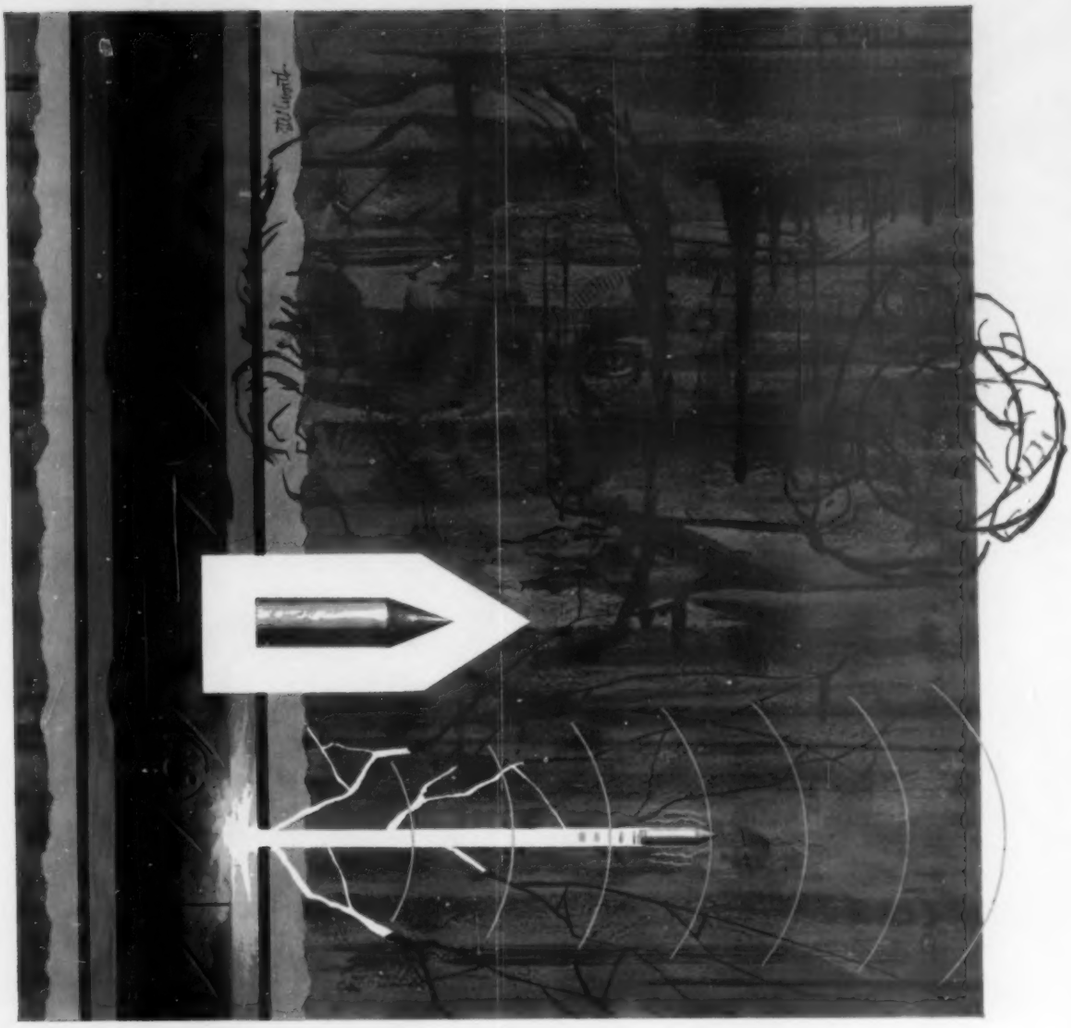
In this refinery Iraq crude is being processed to supply petroleum products for Iraq markets. Consumption of these products in Iraq has increased at a rapid pace, paralleling the economic revolution which a rapidly expanding oil production has brought to the country. In 1954 some 6,630,000 barrels of total products were consumed, representing a rise of about 60 percent within the last five years, as shown in Table I.

Thus, Daura, with its design capacity of 24,000 b/sd or 8,760,000 barrels per year, has been designed to meet the requirements of an expanding market.

Crude for the refinery comes from the Kirkuk fields some 180 miles north of the refinery. The plant was designed and has initially operated on stabilized full range 36° API Kirkuk crude which has a total sulfur content of 2.0 wt percent. The government has a contract with the Iraq Petroleum Co. for the production and export of Iraq crude oils and arrangements were therefore made with IPC to supply crude to the refinery.

The crude is delivered through a newly constructed 12-inch seamless steel pipe line from the IPC's pumping station at Baiji, some 10 miles west of the Tigris and 130 miles north northwest of Daura.

The pipe line crosses a flat route generally sloping downwards from Baiji to Baghdad. Approximately 45,000 b/d could be pumped through the line. Along the northern section of the route, the line crosses a slightly undulating gravel and sand plain. Along the rest of the route, the ground is relatively level plain, the pipe line crossing some cultivated and built up areas. Main pipe line crossings include the Wadi Tharthar flood protection scheme channel and Al-Khir River.



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A new brochure describing the Houdriflow process is available on request. Houdry Process Corporation, 1528 Walnut Street, Philadelphia 2, Pa.

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For corrosion protection the line is cathodically protected with two transformer rectifier systems: one at Baiji and the other at Kadhimain, 12 miles from Daura.

Since the plant was designed to meet projected 1956-57 market requirements, present day sales demands require that the unit run at an average rate of only about 18,000 b/sd or 75 percent of design capacity. However, on August 24, 1955 a test run was initiated on the combination unit to determine the performance at or above design throughput. The throughput was raised to 27,000 b/sd or 112.5 percent of design capacity and the unit performance was excellent, the unit running even more smoothly than at capacities as given in Table II.

The combination unit has proven to be very flexible and easily adaptable to changes in operation necessitated by the variation between current market demand and the design product distribution. It is apparent from the market comparisons shown in Table III that the immediate problems were the sharply decreased current requirements for motor spirit and Bunker "C."

The problem of excess heavy residual fuel oil was solved by reducing gas oil through the cracking coils in the combination reforming-cracking furnace for protection of the tubes against overheating. This accomplished a two fold purpose of decreasing motor spirit production and increasing the availability of middle distillate stock which could be used for sales directly or for cut back of the heavy residium to a lower viscosity fuel oil for which there is a demand.

After considerable study of the problem of over production of motor spirit by the refinery management and engineering department it was concluded that the most feasible solution, as originally suggested by the director general, Mr. Naquib, to the problem was to "tailor" the crude at the producing field. In order not to completely lose the octane advantage of the light front end of the crude only a portion of the crude is deep stabilized, removing the 1BP-350° F. fraction. This fraction is then blended with full crude giving a resultant tailored crude containing approximately half as much straight-run motor spirit but still retaining the entire boiling range of stabilized full crude. Table IV compares the properties of the tailored and stabilized full crude.

The unit has proven to be very adaptable to the changes in tower loadings, etc., incurred by the change in charge composition and general operating scheme.

The refinery has been designed to be entirely self-supporting. It supplies its own utilities and there are complete facilities for plant maintenance, fire protection, and employee welfare such as canteen and a medical center. The major units which comprise the operational part of the refinery are: A combination thermal cracking plant, treating plant for both motor spirit and kerosine product, a powerplant for the production of steam and electrical power, a river water plant for supply of raw river water to the refinery, a power plant for the production of steam and electrical power, a water treating plant for treating boiler feed water and drinking water, a sulfuric acid plant to supply the acid for kerosine treating, and a can plant for the production and filling of five U.S. gallon cans.

Combination Unit: Within this single unit are integrated the following operations: crude oil distillation, naphtha reforming, once through visbreaking, heavy gas oil cracking, gas recovery, motor spirit stabilization and intermediate fractionation.

Two floor fired furnaces supply the crude preheat and the heat to the visbreaker, reformer and cracking coils. Crude preheat and visbreaker coils are contained in one furnace while the second furnace houses the reforming and cracking coils. Both furnaces are equipped to burn either or both fuel gas and heavy residual fuel oil. The superheated low and high pressure steam,

Heaters at the Daura refinery, owned by the Iraqian Government, near Baghdad.

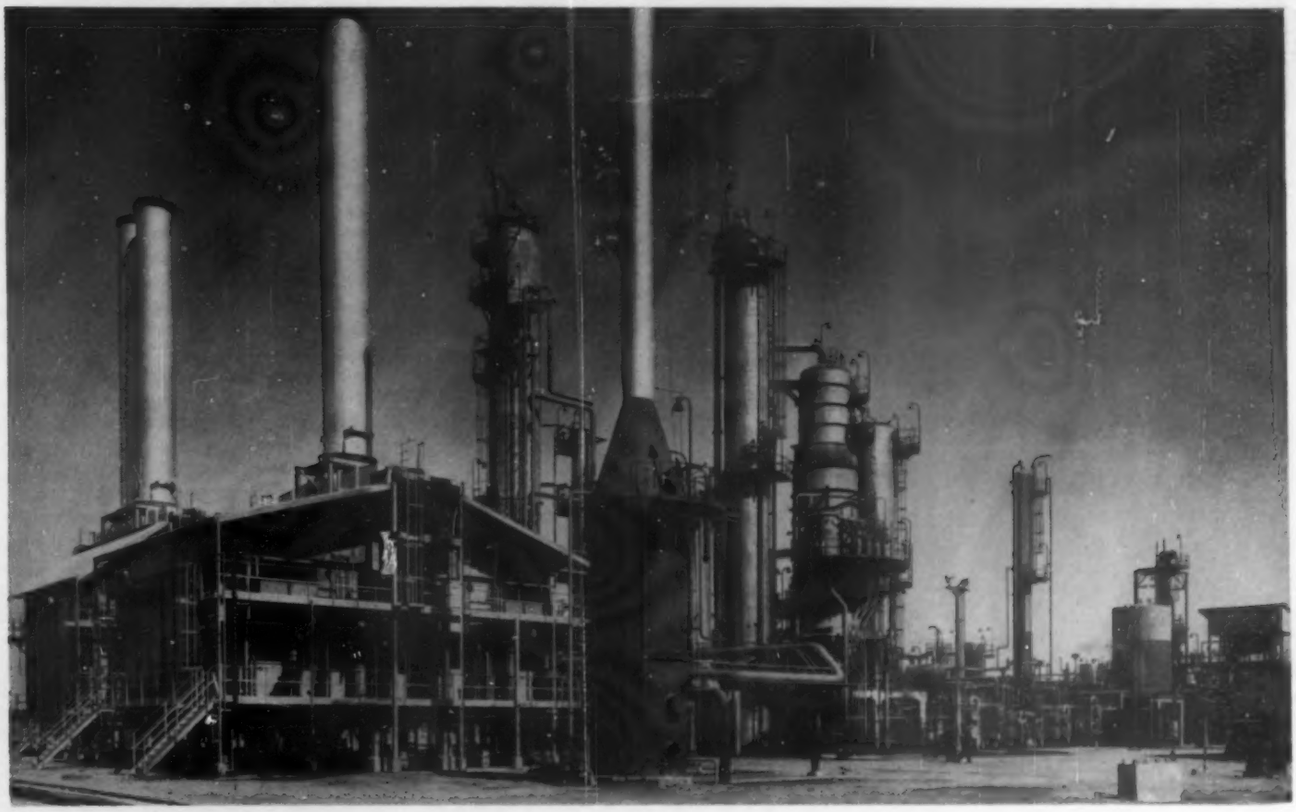


TABLE V.

Material	Storage Capacity (U.S. Barrels)	Days Storage at Design Production Rate
Crude	428,000	18
Intermediate		
Motor Spirit	54,000	8
Kerosine	36,650	10
Gas Oil	15,450	4
Diesel Oil	7,600	3
Fuel Oil	21,000	3
Ethyl Blending	76,000	
Work Tanks	45,800	
TOTAL:	256,500	
Product		
Motor Spirit	272,000	40
Kerosine	170,000	38
Gas Oil	170,000	43
Diesel Oil	76,000	48
Fuel Oil	230,000	35
Bunker "C" Oil	76,000	—
TOTAL:	994,000	

25 psig and 250 psig, required for all stripping come from separate coils installed in the convection section of the combination crude heating and visbreaking furnace. A blow down and stack system take care of oil and vapor disposal resulting from abnormal or emergency circumstances.

The 6,200 b/sd motor spirit treating unit consists of caustic washing, regenerative caustic treating, copper sweetening and inhibitor and metal deactivator injection. The 4,400 b/d kerosine treating unit consists of a sulfuric acid contacting section, a caustic neutralizing section, and a clay contacting section.

The unit possesses a clay contacting section for decolorizing. It consists of a clay storage hopper, elevator, clay kerosine contactor, and sweetland filter. The kerosine leaving the caustic coalescer has been found to possess good color and it has therefore been possible to by-pass the clay contacting step during current operation, thus achieving an appreciable saving in labor and clay costs.

Sufficient tankage has been provided at Daura, keeping in mind the relative market demands and seasonal variation of the various products, to insure that tankage will not become a limiting factor in the operation of the refinery. The distribution depot adjacent to the refinery has storage facilities for all products. A list of the main tankage showing the number of days storage at design production rates is shown in Table V.

No expense has been spared in providing the Daura refinery with a modern raw water plant and cooling water system. Water is pumped from the River Tigris by two 175 hp electric pumps and delivered into two clarifloculators. Alum is added to the inlet stream to aid in floculation. The clear water is then discharged into a four section main reservoir of 3,000,000-gallon capacity. The cooling tower pond provides secondary storage capacity of 760,000 gallons. The silt from the clarifloculators is discharged back to the River Tigris. The average pumping rate from the river is 3,000 gpm.

In order to prevent algae growth, chlorine, in the form of concentrated aqueous solution, is added semi-automatically to both the water reservoir and cooling tower basin.

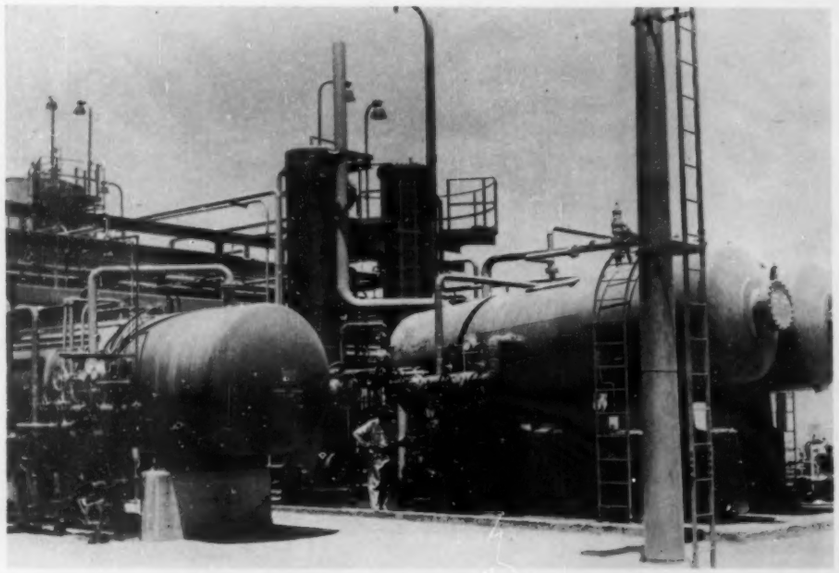
The cooling tower is of the all-film flow, induced draft type, of reinforced concrete construction with a timber cooling grid system. The tower consists of five cells, open at the bottom for air intake and discharging into the cooling tower basin below. The basin is subdivided making it possible to use two, three, or five cells as required. Air flow is induced through the system of 20 thirteen foot diameter fans, four per cell, located at the top of the cells. The tower capacity is 30,000 gpm under design conditions.

The power plant provides steam for all steam consuming equipment within the refinery as well as its own steam required for the turbine driven generators which supply electric power to the refinery. In addition the plant provides compressed air for the refinery air and instrument air systems, and drinking water for the refinery.

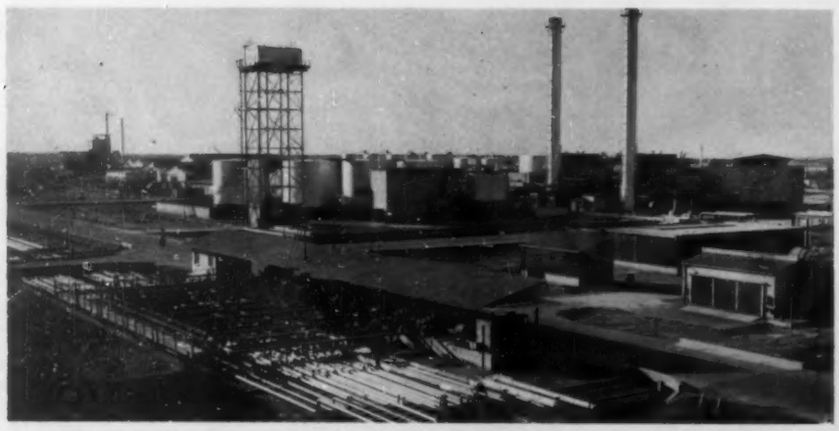
Four boilers, each of 75,000 lbs/hr capacity, generate steam at 265 psig and 500° F. The boilers are out-door type and the flue gases discharge into two self-supporting brick lined chimneys, 125 feet high. The boilers have no induced draft and in consequence the combustion chambers are under pressure. Refinery bunker "C" oil and fuel gas are used exclusively as boiler fuel.

Water from the raw water plant is lime softened and filtered in a 20,000 gph treating plant. Condensate is deaerated and returned to the boiler feed water system.

Three condensing turbo-alternators of 2,000 kw capacity and generating at 3,300 volts, 50 cycles, supply five high tension



Kerosene Treating Unit.



No. 1 product transfer pumphouse at the Daura refinery. Power house is shown in right center, fuel oil and treated water tankage, center and sulfuric acid manufacturing plant, upper left.

substations. The alternator speed is 1,500 rpm and the turbine speed is 6,000 rpm. The low tension net work is supplied at 380 volts three phase for power and 230 volts for lighting. A stand-by diesel-alternator generating at 3,300 volts is available for cold startup of the power plant.

The plant 3,300 volt switch gear is either remote or manually operated and the bus bars are compound filled. Each section of bus-bars is housed in separate rooms with fire proof doors and is further protected by an automatic carbon dioxide fire fighting system.

Compressed air is supplied at 100 psig by three motor driven compressors. All of the air is filtered and approximately 200 cfm of instrument air is also dried. The drinking water for the plant is purified by pressure filtering and chlorinating. A 15,000-gallon storage tank is provided, mounted on a structure 80 feet in height. The plant has a capacity of about 900 gpm.

Complete facilities are provided for the manufacture, from tin plate sheet stock, of standard five U.S. gallon square cans, warehousing finished cans, filling cans with motor spirit, kerosine, diesel or gas oil, and warehousing and shipping filled cans via railroad cars or trucks.

Currently about 170,000 cans per month or slightly over 2,000,000 cans per year of product are being shipped from the refinery. The largest single product volume handled is motor spirit, for distribution to the remote parts of the country, followed by kerosine and then gas oil.

The plant has the capacity to manufacture 12,000 to 15,000 cans in eight hours. Can parts in process of manufacture are moved from operation to operation by means of conveyors or manually when more feasible. Conveyors are also used to move finished cans to the filling operations and on to the filled can warehouse.

Storage space is provided for 50,000 finished cans and 60,000 filled cans. Fork lift trucks capable of handling 90 cans per pallet are used for materials transfer in the warehouse.

For protection against explosive vapor concentration in the can filling room air change is provided by a building blower system and vapor pull off at the nozzles of the filling machines. Any spillage is collected in catch trays situated beneath each filling machine and piped to the oily water sewer. A fog-head sprinkler system is incorporated in the roof of the building as well as in the filled can warehouse.

The "Chemico" process sulfuric acid plant is of the contact type, using vanadium pentoxide as a catalyst for the conversion of sulfur dioxide to sulfur trioxide. The plant is so arranged that sulfuric acid may be produced from burning raw sulfur or by recovery from acid sludge. Approximately 18 tons per day of 98 percent acid can be produced from burning sulfur and it is expected that some seven tons per day will come from the sludge recovery section.

Daura is well equipped to handle any fire that may occur. The refinery is laid out in a block system, with main roads and auxiliary fire roads to provide access to any unit from two or more directions. Space is provided between units to reduce the likelihood of fire spreading from one unit to another. All storage tanks are diked to confine the spread of flammable liquids in the event of a spill.

General view of tankage at Daura refinery.

The main fire fighting equipment is carried by a fire truck and trailer, kept at the main fire station. There are five auxiliary fire houses at strategic locations throughout the plant, where equipment for use of personnel nearest the fire is stored. A regular fire crew of four men per shift is maintained at the main fire station. Additional men from the operating crew are assigned to act as auxiliary firemen.

Although the great majority of the personnel had no previous experience with the handling and refining of petroleum products, they have quickly adjusted themselves to the "safe way" of working.

To establish the rules and to inspect equipment for insurance against failure a combined mechanical inspection and safety department has been established. The primary purpose of the department is to anticipate and prevent accidents and equipment failures which would endanger personnel or interrupt production.

The most modern facilities have been planned to insure ideal working conditions for the employees.

An elaborate change house has been provided with wash rooms and lockers. A canteen will be commissioned in the near future to provide light lunches for the workers on each shift.

A medical center has been established consisting of a plant physician and four dressers or nurses. Periodic checks are made on the health of the refinery personnel and the dispensary is always available for the treatment of the common illnesses or accidental injuries.

Plans have also been made to take care of the worker's needs during his time away from the refinery. A housing area has been mapped out adjacent to the refinery. Fifty modern staff houses are nearing completion and construction has started on 200 houses for the workers. Ultimately the area will be equipped with parks, playgrounds, an athletic field, and a cinema. It is also planned that a shopping center will be erected in the vicinity by private interests. Thus, in time, the town of Daura will spring into existence to provide a balanced, well-integrated life for the people who are playing such a vital role in shaping the country's future.

The Government Oil Refineries Administration, recognizing the steadily increasing demand for higher quality motor spirit, has already announced that the octane of the country's motor spirit will be raised from its present level to 80 research octane number. Careful consideration is being given to the possible addition of a catalytic reforming unit as a source for future additional upgrading of motor spirit quality. The present pilot plant is arranged so that new processing units, storage tanks, and related equipment can be easily added.

A lubricating oil plant is already in the initial stages of construction to be located on the south side of the refinery. Foster-Wheeler Ltd. of London, is the contractor for this plant which will produce 500 b/d of high quality lube oils. Thus, Iraq is "under way" in her program to supply higher quality petroleum products to meet the country's needs completely independent of outside sources. Also it is apparent that the refinery is the keystone of the arch to the production of many other useful products that petroleum provides the raw material for. These among others include aviation spirit, jet aviation fuel, LPGas, fertilizers, insecticides, synthetic rubber, carbon black, cleaners naphtha, painters naphtha, explosives (toluol, tnt, etc.), ammonia, plastics, synthetic fiber and cloth.

Argentina has ample supplies of domestic hydrocarbons on which to build a petrochemical industry and national demand is adequate to support the undertaking. Costs of an industry based on ethylene are lower than synthetics produced from acetylene based on either imported coke or domestic asphaltites.

Petrochemical opportunities in

By Bernardo Rikles*

THE PETROCHEMICAL industry was established in the Argentine Republic with the manufacture of toluene and isopropyl alcohol from oil refinery liquid and vapor fractions at the end of 1943.

A considerable amount of hydrocarbons are available from Argentina's large potential petroleum resources. Yet the manufacture of individual unsaturated hydrocarbons has not been undertaken, but the local oil industry and chemical companies with manufacturing plants are planning the production of synthetic products with acetylene from calcium carbide. This is being manufactured both with imported coke and national asphaltites in the western States of Mendoza and San Juan.

A survey of present and future national hydrocarbon resources proves that a sound and competitive petrochemical industry may be developed only when using petroleum hydrocarbons as starting raw material.

The drastic shortage of aromatics, especially toluene, originated by the Second World War, moved the Argentine Government to search for toluene manufacturing processes using petroleum fractions. After successful pilot runs at the Government Oil Fields' (Yacimientos Petroliferos Fiscales) research laboratories in Florencio Varela, a small plant was built in Compana for Fabricaciones Militares (Army Ordnance Works) and toluene was produced from a straight run narrow cut (96—106°C) from Comodoro Rivadavia crude, using chromium oxide as a catalyst.

This marked the beginning of the petrochemical industry in the Argentine. At about the same time Y.P.F. finished a plant for manufacturing isopropyl alcohol from a propane-propylene fraction from the residual gases of a combination unit with Gyro vapor phase cracking, erected in 1936 by the Argentine Government Oil Fields in San Lorenzo.

In 1945, the same company began manufacturing Ethyl fluid for aviation gasoline in a 220 pound per day pilot plant in its Florencio Varela research laboratories. Production of isopropyl alcohol was maintained at a rate of 660,000 pounds per year until 1948 when the plant was rebuilt and enlarged to 2,640,000 pounds per year.

The toluene plant was replaced in 1951, by the hydroforming and aromatic extraction plant designed and installed by the M. W. Kellogg Co. for Fabricaciones Militares. This unit producing aromatic solvents, toluene, benzene and high octane aviation gasoline has been fully described by the M. W. Kellogg Co. in 1953.

Small amounts of sulfonates had been produced by a chemical company, but this practice has been discontinued. In 1953 a furnace type carbon black plant began running on bunker fuel oil purchased from local fuel distributors.

This plant produces daily one ton of carbon black which has had little acceptance so far. An attempt to produce lamp black by burning residual fuel oil and cooling the flame on a rotating drum has met no success.

Insecticides, and herbicides are manufactured by oil and chemical companies; the active materials are either imported or manufactured from non-petroleum hydrocarbons.

Y.P.F. began producing liquefied petroleum gases in its La Plata (now Eva Peron) refinery and in its Comodoro Rivadavia oil fields back in 1932.

The San Lorenzo refinery started LPGas production in 1936, and private refineries began producing it in 1947, at the request of the State Gas Company (Gas del Estado ENDE), which has the monopoly of gas manufacture and distribution in the Argentine.

The propane cut used as bottled gas, has 98 percent C_3 hydrocarbons. Being fractionated from gases of refineries with thermal cracking units, it contains an interesting percentage of propylene that might be used for chemicals.

From its start, LPGas has been made available only as domestic fuel for homes; restrictions had been and are still in force on its use for industrial purposes, either as fuel or raw material.

In Table II the 1952/53 consumption of products, that may be classified as petrochemicals, is presented with their local production and manufacturing capacity. These chemicals with the exception of isopropyl alcohol and a proportion of benzene are being manufactured from non-petroleum hydrocarbons.

Because of their volume and dollar value, the following products attract attention of chemical manufacturers for their local production: acrylonitriles, polystyrene, polyvinyl chlorides, polyethylene, synthetic rubber (G.R.S.) to replace part of natural rubber and carbon black.

To this list we should add ethylchloride, ethylenedichloride and ethylene-dibromide for ethyl fluid manufacture. Argentina consumed in 1954, 1,560 tons of Ethyl fluid at an approximate cost of US$1,500,000.

The above figures do not give a true picture of Argentina's petrochemical requirements. Exchange and import restrictions are holding back expansion of synthetic chemical production in Argentina.

A large volume of plastic material is classified as non essential and manufacturers find it difficult to get licenses for importing process equipment and raw materials. Import license requests for raw material for 1954 exceeded 22 million pounds.

Imports of motor cars, trucks and tractors are severely restricted and controlled and their prices have skyrocketed; gasoline consumption has remained since 1950 practically on a constant level of 13,230,000 barrels per year. Purchasing power of the people, which began climbing after World War II, began declining in 1950 and has not recovered, as yet, its upward trend.

This situation may change in the near future. The government has granted licenses for the erection of factories to build 13,000 tractors per year and signed a contract with H. J. Kaiser for erecting a plant with an annual capacity of 40,000 motor cars per year. The air forces mechanical shops are building in their factories in Cordoba (I.A.M.E.) motor cars, light trucks and planes; the Army Factories (F.M.) have been interested in erecting a synthetic rubber plant in Argentina and a number of industrial plants are planning expansions or erection of new facilities.

Chemical manufacturers and importers are interested in manufacturing synthetic chemicals in Argentina. Phenol-formaldehyde and urea-formaldehyde plastics, detergents and pesticides are already being produced with imported chemicals. One company is producing polyvinyl-chloride using alcohol as raw material in a one-ton pilot plant. Formaldehyde, ethyl-alcohol, acetone, butyl alcohol by fermentation and hexachloro cyclohexane from benzol and being manufactured by a number of companies. Monsanto and Duperial (I.C.I.) have been granted licenses for the erection of polystyrene plants with an annual capacity of 5,280,000 pounds starting with the

*Technical consultant, Petroquimica E. N.

ARGENTINA

imported monomer. Two companies have projects for the manufacture of polyvinylchloride from acetylene and two others from ethylene, two for producing phenol by benzol sulfonation or chlorination processes, and another is planning the production of acetone and phenol by the cumene process using propylene from V.P.F.'s refinery in San Lorenzo. U.O.P. has estimated that an investment of less than $200,000 would enable Petroquimica E. N. to produce dodecene in its polymerization unit in C. Rivadavia.

The Argentine Chamber of Plasticizers and Molders is clamoring for plants to supply them with plastics, elastometers and phenol.

It has made the following forecast for 1957 consumption.

	THOUSAND LBS.
Phenol	6,600
Acrylic compounds	4,730
Polystyrene	5,500
Polyvinylchoride	6,600
Polyethylene	3,300

Other estimates have practically doubled the above estimates for P.V.C. in 1960.

Synthetic rubber and carbon black requirements have been figured at 15,000 and 10,000 tons, respectively. Ethyl fluid consumption should reach 2,000 tons on the same year.

Some chemical companies interested in the manufacture of plastics, claim that present demand does not justify erecting an ethylene petroleum hydrocarbon plant, and favor the use of acetylene. This is manufactured from calcium carbide produced in the west of Argentina, in the States of Mendoza and San Juan, (in the Andes range) both with native asphaltite and imported coke. These plants are located 621 miles inland from benzene and chlorine plants as well as from the largest consuming centers.

Argentina's oil refineries run 145,000 barrels of crude oil per calendar day and produce more than 14,000 mcf of residual gas.

Y.P.F. on March 1955 started runs in its new 28,000 barrel refinery with topping, catalytic and thermal cracking, delayed coking alkylation and polymerization units. This refinery, 40 miles from Buenos Aires on the La Plata river, will produce, according to pilot plant runs in the M. W. Kellogg, New Jersey laboratories, 12,500 mcf of gas with the estimated composition given in Table I where the average composition of residual gases from other refineries, with thermal cracking units, may be found. The relative low C_3 content of these gases is due to their producing LPGas mentioned before.

Of the refineries tabulated, the San Lorenzo and what was formerly Juan Peron, offer interesting charges for ethylene manufacture. When the San Lorenzo refinery operates its cracking unit at maximum gasoline yield, residual gas runs above 2,800 mcf per day. In 1953 with curtailed gasoline yields, it was held at 1,700 mcf. Its ethylene content averages 15 percent by volume, but it increases to 17 percent with intensive vapor phase cracking of light gas oil.

The M. W. Kellogg Co. has estimated, with cold temperature fractionation, an extraction of 99.5 percent ethane-ethylene fraction and a recovery better than 98 percent ethylene 98 percent pure. Under such conditions, between 17,600 pounds and 33,000 pounds of ethylene could be produced daily.

Such a plant based on Kellogg's process plant costs, would require an investment of around US$3 million. If an ethane recycle cracking unit were added, ethylene production could be raised to 40,000-66,000 pounds per day, and a total investment of $4.5 million (U.S.) has been estimated for this plant erected in San Lorenzo.

Ethylene costs at these plants were figured in 1953 at $1.36 pesos (US$.0971) per pound for 6,600,000 pounds annual production and at $1.10 pesos (US$.07856) per pound for 13,200,000 pounds.

Potential production of ethylene in YPF's Juan Peron refinery, is estimated as of 88,000 pounds per day with cold fractionation extraction and 198,000 pounds with ethane-propane recycle cracking. Although manufacturing costs cannot be figured as yet, they should be lower than those calculated for San Lorenzo.

The catalytic cracker residual oil in the new Y.P.F. refinery, should prove a good oil furnace carbon black charge.

A number of projects have been presented for manufacturing carbon black from natural gas in the northern and Plaza Huincul oil fields. It should be worth while to review these projects analyzing its manufacture in the neighborhood of Y.P.F.'s refinery.

The Sociedad Mixta Siderurgica Argentina, (a joint steel enterprise of government and private capital) is well advanced with its project for manufacturing annually 500,000 tons of steel in San Nicolas (an important harbor) on the Parana river, where a 320,000 kw power house is being erected.

San Nicolas is located 189 miles from Buenos Aires, 56 miles from San Lorenzo, 96 miles from what was formerly Eva Peron, and 189 miles from Mendoza. Its

TABLE I

VOLUME OF REFINERY RESIDUAL GASES IN ARGENTINA

(Percentage)

COMPONENTS	Y. P. F. (E N D E)				ESSO S.A. PET. ARG.		PETROQUIMICA E.N.
	San Lorenzo	Eva Perón	Lujan de Cuyo	New Refy. Juan Perón (Pilot plant)	Campana	Pte. Galva	C. Rivadavia
Non-hydrocarbons				20,4	8,9	4,7	21,2
METHANE	48,2 (1)	62,9 (1)	56,7 (1)	33,9	20,7	32,2	47,7
ETHYLENE	15,5	2,8	24,2	11,1	4,0	5,2	4,-
ETHANE	21,4	25,8		17,4	27,7	20,2	11,5
PROPYLENE	14,2	1,8	13,3	7,4	7,5	12,4	5,2
PROPANE		6,5		5,9	27,0	15,9	5,5
BUTYLENE				0,3	—	—	1,6
I-BUTANE	0,6	0,2	4,1	0,3	4,2	4,3	0,5
N-BUTANE				0,1	6,1	5,6	1,8
PENTANES PLUS	—	—	1,7	—	2,8	4,4	1,0

(1) Includes non-hydrocarbons

TABLE II

ARGENTINE CONSUMPTION AND PRODUCTION OF ORGANIC CHEMICALS
(Thousand of Pounds)

Product	Consumption 1952	Consumption 1953	Local Production	Max. Plant Capacity
Acetone	1,543	NA	1,102	2,204
Acetic Acid & Deriv.	——	——	——	——
Acrilates & Deriv.	1,322	1,984	Imported	
Benzol	1,653	NA	1,653	MS
Butanol (Butyl Alcohol)	2,645	NA	2,425	4,409
Cellulose Acetate	NA	2,645	Imported	
Carbon Black (1)	12,996	9,879	Imported	
Ethylene Glycol	220	NA	Imported	
Formaldehyde	4,409	4,850	3,086	5,291
Phenol	2,645	3,968	Imported	
Pthalic Anhydride	1,102	NA	1,323	2,645
Polyethylene	661	1,763	Imported	
Polystyrene	3,307	3,527	Imported	
Polyvinyl Chloride	4,409	4,630	Imported	
Resins (Synthetic)	3,307	NA	Imported	
Rubber (Nat. & Synthet.)	37,038	50,265	Imported	
Toluene	531	661	1,874	MS
Xilol	496	NA	1,102	

(1) Imports
(NA) Not Available (Values have been estimated similar to 1952 with a tendency to increase).
(MS) Restricted Military Information

Note: In this and following tables all kilogram values have been converted at the rate of 2.20462 pounds in a kilogram. All Argentine peso values have been converted at the rate of 14 pesos per dollar or one peso equals 7.142 U.S. cents. Totals vary slightly due to rounding.

TABLE III

ESTIMATED ETHYLENE COST FROM RESIDUAL GAS OF Y.P.F.'S SAN LORENZO REFINERY

Estimated Investment—30,000,000 Arg. Pesos
2,142,600 U.S.$

Direct Costs	Unit Value Arg. Pesos	Unit Value U.S. Cents	Cost Per Kilogram Arg. Pesos	Cost Per Pound U.S. Cents
Feed 123.58 mcf	0.08	.05	0.3	.972
Fuel & Desiccant			0.1	.324
Utilities			0.7	2.27
Operating Labor			0.2	.65
Supplies			0.4	1.36
Maintenance			0.2	.65
Gross Direct Costs			1.9	6.155
Credit by products			0.3	.972
Net Direct Costs			1.6	5.183
Indirect Costs				
Depreciation			1.0	3.24
Taxes, Insurance, Interests			0.3	.972
General Plant Expenditure			0.1	.324
			1.4	4.535

Total Production Cost—3. pesos per kilogram
9.718 U.S. cents per pound
Annual Production 3,000,000 kilograms (6,613,860 lbs.)

TABLE IV

ESTIMATED ETHYLENE COST USING STRAIGHT RUN HEAVY NAPHTHA IN PETROQUIMICA'S COMODORO RIVADAVIA REFINERY

Estimated Investment—70,000,000 Arg. Pesos
4,999,400 U.S.$

Direct Costs	Unit Value Arg. Pesos	Unit Value U.S. Cents	Cost Per Kilogram Arg. Pesos	Cost Per Pound U.S. Cents
Feed (5.3 Lts.)	0.29	2.07	1.5	4.9
Chemicals and Catalyst			0.2	.65
Operating Labor			0.2	.65
Fuel			0.1	.32
Utilities			0.3	.97
Supplies			0.4	1.3
Maintenance			0.2	.65
Gross Direct Cost			2.9	9.4
Credit by products (Including benzol)			2.0	6.5
Net Direct Cost			0.0	2.91
Indirect Costs				
Depreciation (10 years payout)			0.7	2.267
Taxes, Insurance, Interests			0.3	.97
General Plant Expenditure			0.4	1.3
			1.4	4.53

Total Production Cost—2.3 pesos per kilogram
7.744 U.S. cents per pound
Annual Production 10,000,000 kilograms (22,046,200 pounds)

TABLE V

ESTIMATED ACETYLENE COST BY WULFF PROCESS USING NATURAL GAS

Estimated Investment—60,000,000 Arg. Pesos
4,285,200 U.S.$

Direct Costs	Unit Value Arg. Pesos	Unit Value U.S. Cents	Cost Per Kilogram Arg. Pesos	Cost Per Pound U.S. Cents
Feed 42,500 Cal.	0.15	1.07	0.6	1.9
Operating Labor			0.1	.32
Utilities			0.9	2.91
Supplies			0.4	1.3
Maintenance			0.3	.97
Gross Direct Cost			2.3	7.45
Credit by Product			0.1	.32
Net Direct Cost			2.2	7.13
Indirect Costs				
Depreciation (10 years payout)			0.6	1.9
Taxes, Insurance, Interests			0.4	1.3
General Plant Expenditure			0.4	1.3
			1.4	4.53

Total Production Cost—3.6 pesos per kilogram
11.66 U.S. cents per pound
Annual Production—10,000,000 kilograms (22,046,200 pounds)

TABLE VI

ESTIMATED VINYL CHLORIDE COST USING ETHYLENE AND CHLORINE THAT COULD BE MANUFACTURED BY PETROQUIMICA IN COMODORO RIVADAVIA

Estimated Investment—39,000,000 Arg. Pesos
2,785,380 U.S.$

Direct Costs	Unit Value Arg. Pesos	Unit Value U.S. Cents	Cost Per Kilogram Arg. Pesos	Cost Per Pound U.S. Cents
0.63 Kg. Ethylene	2.3	16.4	1.4	4.535
1.6 " Chlorine	1.0	7.1	1.6	5.183
Chemicals			0.1	.324
Operating Labor			0.4	1.3
Utilities and Fuel			0.5	1.62
Supplies			0.5	1.62
Maintenance			0.3	.972
Gross Direct Cost			4.8	15.49
Credit (Hcl) by product (0.8 Kg.)			0.8	2.6
Net Direct Cost			4.0	12.96
Indirect Costs				
Depreciation (10 year payout)			1.3	4.21
Taxes, Insurance, Interests			0.5	1.62
Royalties			0.5	1.62
General Plant Expenditure			0.3	.97
			2.6	8.42

Total Operating Cost—6.60 pesos per kilogram
21.38 U.S. cents per pound
Annual Production—3,000,000 kg. (6,613,860 lbs.)

TABLE VII

ESTIMATED VINYL CHLORIDE COST USING ACETYLENE FROM CALCIUM CARBIDE

Estimated Investment—30,000,000 Arg. Pesos
2,142,600 U.S.$

Direct Costs	Unit Value Arg. Pesos	Unit Value U.S. Cents	Cost Per Kilogram Arg. Pesos	Cost Per Pound U.S. Cents
2 Kg. Calcium Carbide	4	28.6	8.0	25.9
1 Kg. Hydrogen Chloride	1.75	12.5	1.8	5.8
Chemicals, Catalyst			0.3	.97
Operating Labor			0.3	.97
Utilities, fuel			0.5	1.62
Supplies			0.4	1.3
Maintenance			0.2	.65
			11.5	37.25
Indirect Costs				
Depreciation (10 years payout)			1.0	3.24
Taxes, Insurance, Interests			0.7	2.27
Royalties			0.5	1.62
General Plant Expenditure			0.4	1.3
			2.6	8.42

Total Producing Cost—14.1 pesos per kilogram
45.67 U.S. cents per pound

VINYL CHLORIDE FROM NATURAL

Gas Acetylene—9.2 the kilogram
Annual production 3,000,000 kilograms (6,613,860 lbs.)

coke ovens, under construction, are expected to produce 15,400,000 pounds of benzene per year. This total production could be made available for styrene manufacture, and requirements for polystyrene and synthetic rubber estimated for 1960 could be entirely satisfied.

The ethylene needed could be produced by cold fractionation extraction at either of Y.P.F.'s above mentioned refineries.

Geological and geophysical surveys by Y.P.F.'s staff indicate the existence of large underground petroleum accumulations in the Argentine. Lack of adequate equipment and other reasons, slacked wildcat drilling and national oil production have not been able to meet oil consumption (despite restrictions on liquid fuel utilization since World War II.). Argentina is importing more than 50 percent of its fuel requirements, and residual fuel makes up more than 53 percent of the total fuel consumption.

Y.P.F.'s project for developing the Argentine northern oilfields on the border with Bolivia, call for the erection of a light hydrocarbon recovery plant to produce liquid propane and butane, to be pumped through a 12¾-inch product line for gasoline, kerosine and diesel oil. The terminal of this line is to be located in San Lorenzo.

The natural gas reserves of these fields have been estimated at 50 billion cubic meters or 1.7 billion mcf.

This natural gas is to be used for replacing imported fuel oil, and a 24-inch gas line on its way to Buenos Aires passing through San Nicolas, is to deliver 176,550 mcf of natural gas per day to fuel industrial plants and power houses.

From this gas 603,000 pounds of propane and 515,000 pounds of butane would be recovered as LPGas.

The withdrawal of 176,550 mcf of gas per day from the northern oil fields would deplete the reserves in under 30 years. Under such circumstances it would be unwise to build petrochemical plants to be fed only with LPGas from the north.

The new petroleum policy of the present Government, according to published statements, aims to attract private enterprises for developing the country's petroleum resources. A larger share of private capital in Argentine oil industry should bring a substantial increase in petroleum production and balance its power requirements. When this condition is reached, LPGas and natural gas may be channeled to manufacturing petrochemicals in larger quantities and turn Argentina into a synthetic chemicals exporting country.

Meanwhile, the chemical industry must rely on residual gas from refineries with thermal and catalytic cracking units.

Although some 44 million pounds of chlorine are being produced annually in electrolytic plants in the neighborhood of San Lorenzo and Buenos Aires, only a small part of it may be available for producing chlorinated hydrocarbons. For these later petrochemicals, Comodoro Rivadavia offers the best location.

Petroquimica E.N. has finished in the vicinity of its 7,500 barrel refinery in the Comodoro Rivadavia oil fields 494 acres of evaporating ponds to recover annually 88,000,000 pounds of sodium chloride from waste sea water of the cooling system of the refinery.

This salt is for preparing brine to be electrolized in a 50 ton caustic soda plant contracted with Oronzio De Nora of Milan, to be erected near the pond 1.8 miles from the refinery.

For the last 20 years the net evaporation in Comodoro Rivadavia has averaged 51.2 inches of water per year; it has been estimated that 213,000 pounds of salt per acre should be recovered with prevailing climatic conditions. In a survey made in 1946 for the production of ethyl fluid in Argentina, Comodoro Rivadavia was chosen as the most adequate location for the recovery of bromine from sea water and the production of ethylene dibromide. Oil in Comodoro Rivadavia was discovered in 1907; its fields are still leading in production, and in 1953 they produced 62 percent of the total Argentine oil output.

According to Y.P.F.'s geologists, important oil accumulations are to be found in the south and southwest, and the whole zone is considered as a promising oil producing territory. Gas and oil have been struck in Santa Cruz and Tierra del Fuego in the south.

Practically all of the available gas in the Comodoro Rivadavia and Canadon Seco 68 miles south of Comodoro Rivadavia oil fields feeds the 1,000 mile 10-inch gas pipe line to Buenos Aires, which is working at 50 percent designed capacity. This cuts out, for some time, the chance of natural gas as a feed for ethylene manufacture.

This hydrocarbon may be manufactured at a competitive price, by vapor phase cracking of straight run light liquid fraction from Comodoro Rivadavia crude in Petroquimica's refinery.

Preliminary estimates, made in 1953, based on process plant quotation from the M. W. Kellogg Co., place the investment for an ethylene plant with an annual capacity of 22 million pounds at $6 million US. Ethylene could be manufactured in this plant at a cost of 2.30 Argentine pesos per kilogram which at the official exchange rate of 14 pesos per dollar (used throughout the article) is 7.45 cents per pound.

The 13 million pounds of P.V.C. and 4,400,000 pounds of Ethyl fluid, 1960 estimates requirements, would absorb nearly 11 million pounds of ethylene.

Producing 15 tons of ethylene in a 30-ton plant the cost would go up to 3 Argentine pesos per kilogram or 9.7 U.S. cents per pound. This cost could be lowered in Petroquimica's refinery, running the plant for gasoline reforming during the period of low ethylene demand.

Using calcium carbide at $4 pesos per kilogram to make acetylene, vinyl chloride cost has been figured at 14 Argentine pesos per kilogram or 45.35 U.S. cents per pound.

Acetylene from natural gas by the Wulff process, using the figures given by the Lummus Co. in 1953[2] may be produced, in a 30-ton plant at 3.6 Argentine pesos per kilogram or 11.66 U.S. cents per pound, and vinylchloride at 9.2 Argentine pesos per kilogram or 29.81 U.S. cents per pound.

Manufacturing vinylchloride, ethylchloride and ethylene dibromide in neighboring sides, by-product hydrogen chloride from dehydrohalogenation or dichloroethane in the production of vinylchloride could be used for ethyl-chloride manufacture, sea water acidification in bromine recovery and lowering costs of sodium chloride precipitation in the sea water evaporating ponds.

Chlorine in Comodo Rivadavia, because of the low cost fuel, may be manufactured at lower costs than in the eastern plants near San Lorenzo and Buenos Aires.

In Comodoro Rivadavia, with ethylene at 7.45 U.S. cents per pound, crediting the vinylchloride plant for by-product hydrogen chloride, cost of vinyl chloride has been figured at 6.6 Argentine pesos per kilogram or 21.38 U.S. cents per pound.

Population in Argentina is increasing at a rate above 300,000 persons per year; at the end of 1954 it reached 18,919,000 people. The standard of living has increased since World War II. Refrigerators, washing machines and other home appliances are being manufactured locally in increasing quantities. The need for petrochemicals is unquestionable. International operating chemical companies which surveyed the Argentine market for synthetic organic chemicals favor local production of plastics and elastometers.

Separate production of ethylene for a single petrochemical plant is uneconomical and in no way practical.

Looking at the industry as a whole, it is very difficult to accept other than ethylene as the building stone for Argentina's petrochemical manufacture.

The government, through the state owned refineries with interesting potential ethylene resources, should sponsor the production of ethylene giving it preference over other projects.

If ethylene is not made available to the chemical industry, in the very near future, Argentina may find itself with a petrochemical industry founded on high cost raw material, in part of foreign origin, that will turn it into an unprofitable and uncompetitive enterprise.

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Note: Conversions in the body of this report have beeen made at the rate of 2.2 pounds per kilogram. Exchange rate used is the rate of 14 pesos per dollar or one peso equals 7.142 U. S. cents.

Sand blast cleaning of reclaimed pipe at field pipe yard.

Torno-Blast tool equipped with roller guides for cleaning 12-inch pipe.

High speed in place cleaning of exchanger, condenser and still tubes and field cleaning of oil country tubular goods made possible by new sand blast tool.

Tube cleaning method demonstrated

A new tool for high-speed cleaning of oil industry tubular goods was demonstrated at San Francisco during the recent annual meeting of the American Petroleum Institute. The tool employs sandblasting techniques to replace or supplement turbine cleaning. Its success in cleaning the interior walls of pipe rests on a conical diverter which directs sand, or other abrasive, outward to the tube's inner surface, from the sand blast nozzle.

Field tests have been conducted at refineries in the San Francisco Bay area and in field pipe yards where oil country tubular goods are reconditioned for further use. In refineries much of the work has been done in cleaning heat exchanger and condenser tubes without dismantling the tube bundles and in still tubes as a replacement for turbines.

The new tool was invented about two years ago by Marvine E. Fritze of Seattle who conducts a sand blasting business in that city. Development work has been carried out by the J. C. Fennelly Co. at San Francisco. The tool has been given the trade name Torno-Blast.

There are no moving parts in the Torno-Blast tool. Abrasive is carried at high speed by a stream of air from a conventional sandblasting pot. The abrasive is directed through a straight or venturi type nozzle. Up to this point it is a standard sandblasting procedure. The abrasive leaves the nozzle and immediately starts to spread out as does a shotgun blast. A conical diverter made of carboloy is fixed concentrically within this stream of abrasive particles. These particles are deflected at varying degrees to strike the interior surface of the pipe. Venturi nozzles are used in larger models to increase velocity and hence cleaning action.

The diverter is placed relatively close to the end of the nozzle with little chance of reducing their speed before impinging upon the inner wall of the pipe. Ricochetting particles, although partially spent, still serve to clean the deposit.

On the smaller tools, the air volume in itself is sufficient to blow all abrasives and deposits out ahead of the tool and out the open end of the pipe. On the large tool a baffle plate is used. This merely confines the exhaust outlet and by so doing, its velocity is accelerated to such an extent that all residue is blown out the open end.

The speed at which the tool is moved through a pipe is proportional to the hardness or toughness of the deposit, the abrasive used and the degree of cleanliness required. There have been jobs cleaned at the rate of one foot per second. Others have been cleaned at one foot per three to five minutes.

Tools for use in large diameter pipe are provided with adjustable roller guides to keep the nozzle and diverter centered. This is necessary to achieve uniform cleaning throughout the pipe circumference. Guides can be adjusted to fit any diameter pipe from four to 12 inches. At present four tool models are being made to clean pipe from a half inch to 12 inches in diameter.

Tungsten carbide diverters are replaceable to extend useful life of the tool. Metal wearing surfaces are made of No. 999 Carboloy or equivalent.

Compressed air requirements of the tool are said to be lower than for turbine cleaning with mechanical cutters. The smallest tool requires 50 psi at 22 cfm. The large tool uses up to 125 psi at 500 cfm.

Tube still cleaning tests at West Coast refineries have indicated that best results are obtained by roughing out heavy coke with a turbine or thermal decoking. After the deposit is reduced to about 1/16 inch the Torno-Blast removes the remainder. Reports are that this method extends tube life since there is no metal loss and all corrosion pits are thoroughly cleansed. Coke lay-down on the succeeding run is said to be retarded because of the better cleaning job done by sand blasting.

Condenser bundles at one refinery consisting of one-inch i.d. brass tubes were giving trouble because of electrolytic deposits which were difficult to remove because of softness of the tubes. Chemical cleaners did not remove the very hard deposits and mechanical cutters were not feasible. The sand blasting method was successful and it was found possible to produce a satin finish on tube walls without dismantling tube bundles.

A wide range of abrasives have been developed to cover the many cleaning requirements studied. Agricultural abrasives have been found to serve well in removing grease, oil, carbon and similar materials without damaging soft metals. The absorbing ability of the abrasives give an effect similar to wiping. Nut shells, rice hulls and ground corncobs have been used either alone or mixed with more abrasive grits. Other abrasives may be natural sands, metallic, particles or shot, or artificial materials such as silicon carbide, aluminum oxide, glass beads, or rock wool products.

Oil field pipe yard cleaning tests have been conducted on line pipe, upset end pipe, casing and perforated tubing.

On a recent test it was found that a four-man sandblast crew was able to clean 9,600 feet of 10-inch pipe per day. This included set-up time, actual cleaning time, tool removal and repositioning, retrieving abrasive for reuse and blowing pipe clean after sandblasting. Daily cost was calculated at $168 or about 1.73 cents per foot. A comparable wire-brush job by the company where the tests were made required a 5-man crew to clean 4,000 feet of pipe per day at a cost of 3.55 cents per foot.

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British Oil News

By E. Lawson Lomax

Internal consumption of petroleum products in the U. K. has risen considerably during the first nine months of 1955 to 17,235,018 tons compared with 15,-526,344 tons for the equivalent period of 1954, an increase of 11 percent according to statistics published by the Petroleum Information Bureau.

The largest percentage increase was in fuel oils which show a rise of 21 percent, 671,683 tons. Deliveries of kerosene are up by nearly 11 percent. The increase was caused by the growing demand for home heating by kerosene. From a thermal efficiency standpoint the modern kerosene burning stove when used for space heating is much superior to either gas, electricity or the conventional open fireplace. Another development, which as yet is in its early stages, is the use of kerosene as fuel in small domestic boilers, which it is said cost about the same amount to run on kerosene as on coal.

Refinery Extensions

The Vacuum Oil Co. Ltd. has announced that it is building a 6,000 b/d Savaformer at its Coryton refinery in Essex. This Savaformer, is a catalytic reforming process, using a platinum catalyst, for the production of high octane rating gasoline, from a naphtha feed product of low octane rating, which has been developed by the research department of Socony-Mobil Co. The plant is being built by Bechtel International Ltd. for completion in August 1956.

Shell has announced that it is building a plant at its Shell Haven refinery for the production of 20,000 tons of alkylate per annum, in conjunction with a platforming unit on stream in its Stanlow refinery.

At Abadan aviation gasoline for local use has been produced. The large cat cracker is now on stream and a larger alkylation plant enabling the refinery to again manufacture aviation gasoline for export.

Thames Estuary Fertilizer Plants

An agreement has been signed between Shell Chemical Co. Ltd. and Fisons Ltd. for construction of two new plants on the Thames Estuary for the manufacture of fertilizers. The first of these two plants will be for the production of 75,000 tons per year of anhydrous ammonia at Shell Haven, the starting material for which will be refinery gases (or other petroleum hydrocarbons). The second plant which will be built nearby by Fisons, Ltd. at a cost of £4.5 million will use about 60,000 tons of ammonia from the first plant for the production of ammonia based fertilizers.

Oil Industries Club

The nineteenth annual dinner of the Oil Industries Club was held at Grosvenor House on Friday, Nov. 18, 1955 under the Presidency of L. W. Berry, O.B.E. The principal speakers at the gathering were, in addition to the president, Sir John Maude, G.C.B. Permanent Secretary of the Ministry of Fuel and Power and Edwin G. Moline, Acting Deputy of the Minister of Economics, American Embassy.

BP and Transantarctic Expedition

British Petroleum Co Ltd. is providing free of cost all petroleum fuels, lubricants and ship's bunkers for the Transantarctic Expedition which has just left England, led by Dr. Vivian Fuchs in the expedition's ship "Theron." Further, British Petroleum Co. Ltd. has commissioned World Wide Pictures Ltd. to make a film record in color of the expedition. A World Wide cameraman Derek Williams will record the setting up of the base camp on the Weddell Sea. The journey across the Antarctic continent will be filmed by George Low, and a full length film will be completed after the party's return.

Tanker News

The outstanding feature in the tanker industry has been the launching from the Barrow-in-Furness Yard of Vickers-Armstrongs Ltd. of the 47,750 dwt steam turbine driven tanker "Spyros Niarchos" built to the order of Stavros S. Niarchos; the largest tanker in the world. This vessel is the ninth of the first group of ten orders placed with Vickers-Armstrongs by Mr. Niarchos, earlier ships launched from Vickers yards being "World Harmony," "World Enterprise," "World Concord," "World Unity," "Saxonmead," "Saxonglen," "Saxondale," and "Saxonglade."

The ship's trading route will be between the Persian Gulf and United Kingdom ports.

Scotts' Shipbuilding and Engineering Co. Ltd., Greenrock, Scotland announce that the 18,000 dwt steam turbine tanker "Caltex Edinburgh" built by them to the order of Overseas Tankship (U.K.) Ltd. was successfully launched from their Greenrock yard on Nov. 2, 1955. This is the tenth tanker to be launched in this country for Overseas Tankship (U.K.) Ltd.

Harland & Wolff Ltd. announce the successful launching of the 32,000 dwt st tanker "Elin Knudsen" built by them to the order of Knut Knutsen, O.A.S. of Hangesund, Norway from their Belfast Shipyard on Nov. 17, 1955, the launching ceremony being performed by Mrs. Anna Knutsen.

Newman, Hender & Co. Ltd. In Canada

Newman, Hender & Co. Ltd., of Woodchester, Glos., England has established a Canadian subsidiary company, under the name Newman, Hender (Canada) Ltd. The mission of the new company is to still further develop the distribution, servicing and stocking of Newman, Hender products in Mid-Western Canada. It will provide an expert, practical and technical service in valves and their applications.

Manchester Oil Refinery (Holdings), Ltd.

In announcing the interim dividend of four percent less tax, stockholders are advised that the current year's profits will be somewhat lower than in the previous financial year. Assuming that current trading conditions were maintained during the remaining six weeks of 1955, the board expected to recommend the payment of a final dividend of 8½ percent less tax, thus making a total distribution of 12½ percent less tax as in the previous year.

New Medium-Speed High-Power Diesel Package Unit

This new unit has been developed by the English Electric Co. Ltd. for use in driving an Ideal-Oweco type C350 slush pumps. One of these units complete with slush pumps has been ordered by Balfour Williamson, Merchant Shippers Ltd. for export to Peru where it will be used in Lobitos oilfields.

The engine is normally rated at 647 bhp when running at 850 rpm but for this order was arranged to operate at a speed of 800 rpm providing a continuous package unit output on site of 495 bhp. The independent power-driven slush pump unit is mounted on a main frame, carrying the engine driven package unit, connected by chain drive to the slush pump assembly. The drive to the slush pump is by 1½ pitch quadruple-drive chain running in an oil bath. The Oil Well Engineering slush pump (C350) is of the Duplex double acting type giving a maximum fluid pressure when operating at 3,000 pounds per square inch and is one of a large range manufactured by the company.

Interim Dividend Announcement

The Board of the British Petroleum Company Ltd. announce that at a meeting held in November they declared an interim dividend in respect of the results for 1955 on the issued ordinary stock of one shilling per £1 unit of stock free of income tax, payable on Dec. 1, 1955. It is also the board's intention that, in view of the materially changed position of the company as regards United Kingdom taxation, future dividends on the ordinary stock should be declared free of income tax.

Two General Meetings Held In Mexico City

Two extraordinary general meetings of the shareholders of the Compania Mexicana De Petroleo "El Aguila," S.A. (The Mexican Eagle Oil Company, Ltd.) was held in Mexico City on Friday, Nov. 4, 1955.

The first meeting was held at 11:00 a.m. for the purpose of: (1) reducing the capital of the company by 97,062,946 Mexican pesos by repaying this amount of paid up capital pro rata to the holders of the preference and ordinary shares of the company, to be satisfied by the payment of 52 &.S. cents for each ordinary and preference share of the company; (2) authorizing the board of directors to make all suitable arrangements to effect the repayment including the fixing of the date and place or places of repayment; (3) approving the amendments to the Deed of Organization and By-Laws of the company necessary in consequence of the foregoing.

The second meeting was held at 12:00 noon for the purpose of: (1) increasing the paid up capital of the company by transferring from general reserve the sum of 313,587,981 Mexican Pesos; (2) approving the amendments to the Deed of Organization and By-Laws of the company necessary in consequence of the foregoing.

The board of directors emphasized that the proposal to increase the capital of the company is considered to be in the best interests of the shareholders having regard to the capital repayments which have been to them out of the amounts payable by the Mexican Government to the company under the terms of the agreement of the 29, August, 1947.

Under Mexican law the favorable vote of the holders of at least 50 percent of the shares of the company is required in order that the necessary resolutions may be carried.

London & Thames Haven Oil Wharves, Ltd.

The company has initiated a program of expansion in its desire to meet the growing demands of its customers for additional tankage. The total cost of the extensions (completed or contracted for) is estimated at £2,150,000. Of the total cost the directors propose to raise approximately £1,000,000 by the issue of further ordinary shares and to find the balance from the company's own existing and accruing resources. The new ordinary shares will be offered to existing ordinary shareholders, and will rank for dividend and in all other respects pari passu with the existing ordinary shares.

Kern Oil Co. Ltd.

The directors of Kern Oil Co. Ltd. at their meeting on Nov. 2 resolved to recommend a dividend for the year ended 31, May, 1955, payable on Jan. 2, 1956, of 17½ percent and a bonus of 7½ percent, total 12 pence per stock unit of 4s, less income tax at 8s.6d. in the pound, absorbing a net amount of £173,039. The net profit for the year was £312,679 after debting £171,263 for depreciation and providing £304,066 for taxation. Dividends from subsidiary companies are included in these figures.

Personnel

Vickers Ltd. announce that Lt. General Sir Ronald M. Weeks, has decided to vacate his office of chairman of the company on May 31, 1956 by which date he will have passed the normal age for retirement from executive office under the company.

Shell-Mex and B. P. Ltd. announce that H. Cunliffe has been appointed general manager, industrial fuels. This appointment is a new one which the company has created in view of the growing importance of the fuel oil side of their business.

Caltex Trading and Transport Co. Ltd. announce that E. E. Jones, manager of charters and traffic has been appointed assistant general manager of the transport division effective Nov. 1, 1955.

Sharples Centrifuges Ltd. of "Tower House," Woodchester Stroud, Glos, announce the appointment of M. E. O'Keefe Trowbridge, as a director of the company.

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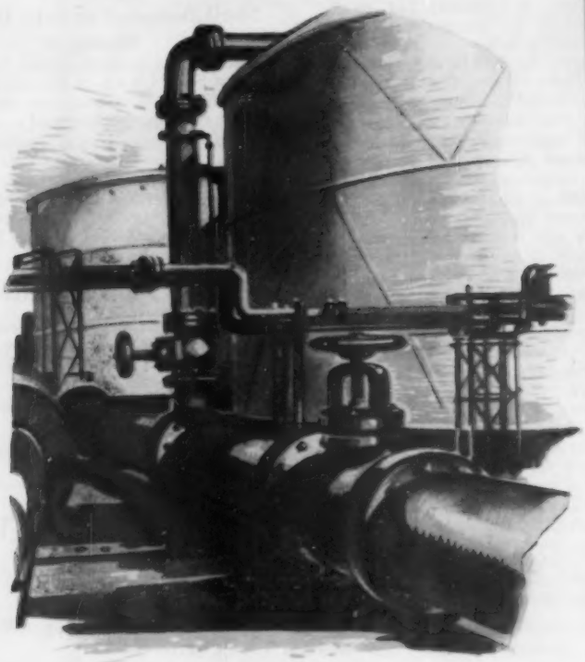

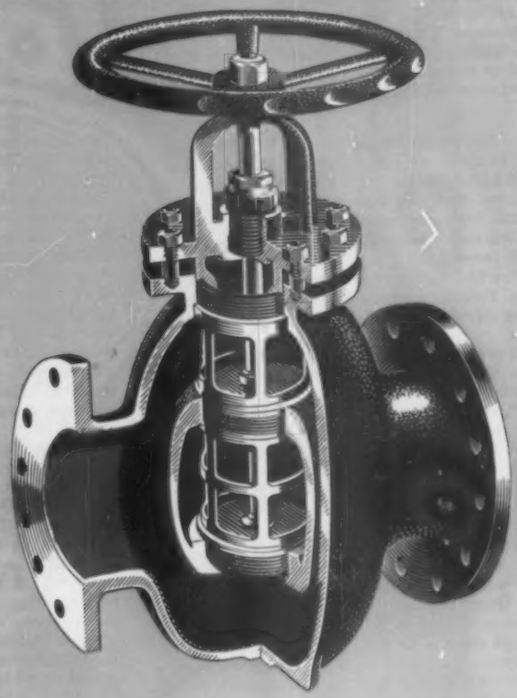

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Canadian Notes

I. J. Irwin

Canadian crude oil production increased 32 percent in 1955 to 127 million barrels according to preliminary estimates. The increase of 31 million barrels compares with a 14 million barrel rise in 1954.

Rapid expansion in export demand for Canadian crude in late months of the year far overbalanced the normal seasonal decline in consumption on the prairies.

Domestic buyers of Alberta crude, by provinces, according to their present volume of demands, are Ontario, Alberta, British Columbia, Saskatchewan and Manitoba. Increased demands for export on the Pacific Coast have now resulted in Trans Mountain Oil Pipe Line traffic exceeding 100,000 barrels a day. Around 55 percent of this daily throughput is for export to the Shell refinery at Anacortes, Wash. and the General Petroleums refinery at Ferndale, Wash., the balance representing demands from British Columbia.

Total export from Alberta and Saskatchewan to the Pacific Coast and the Mid-Continent is now nearly 23 percent of the production from these two provinces. The Canadian dollar returning to par late in October may be significant in expanding foreign markets for Canadian oil.

Allowable production for Alberta for November was placed at 351,230 barrels per day. Traffic through the Interprovincial line for November was 178,800 barrels per day.

Before the discovery of the Leduc-Woodbend area early in 1947, by Imperial Oil, Canadian oil production was seven percent of Canadian oil demand. The latest published figure on Canadian oil consumption is 590,800 barrels a day, as in September 1955. Two months later, in November, Alberta's production was at the rate of 351,230 barrels a day, or 59.53 percent of Canada's consumption. That percentage today could be considerably increased, and still keep within a safety margin to the productive potential of wells, if points further east in Canada could be economically reached.

The Alberta treasury has received $418,727,085 during the past nine and a half years from oil and gas rights. For the six months' period to September 30, 1955, receipts totalled $52,391,775. The largest source of revenue since 1946 has been the Crown reserve lease sales which totalled $156,581,661 from 342,236 acres. Second came royalties from oil and gas production bringing a total of $88,163,850, and a revenue of $71,271,164 for leases, fees and rentals came third. For 1955 March to October, inclusive, Crown reserve lease sales brought a total of $14,-264,597 from 21,552 acres, while 590,880 acres of reservation sales brought in $13,203,043 for this period.

The all time high for production in Alberta came in July with a permitted daily production of 362,327 barrels a day. Records were established during the present year in drilling. August produced a record of 999,514 feet, an increase of 108,055 over the previous month. This brought footage drilled to the end of August from the beginning of the year to 6,220,-853 to compare with 3,555,817 for the same period in the previous year. Rigs active in August totalled 165 compared with 79 in August 1954.

Pipe line construction in 1955 changed from trunk lines to feeders and gathering systems which were very active.

In Saskatchewan, the line from Coleville through Saskatoon to Prince Alberta, and in Alberta, the Grande Prairie, Dawson Creek and surrounding area connections were of great importance. Also was the approved application, reported late in October, regarding construction of the gas line from the Alexander Indian Reserve to Wabamun, 33 miles, and to the site of the new pulp mill under construction at Hinton, 136 miles to the west.

Refinery expansion through the year was continuous. Construction of a new wax plant at Sarnia was started late in 1955 by Imperial Oil Ltd. Also starting about the same time in Sarnia was a catalytic reformer which will supplement units built only two years ago. This new construction, to cost about $5 million, is being carried out to meet higher octane requirements for motor gasoline.

Official opening of Imperial's new $13 million lubricating oil plant at Edmonton on November 2 to make 41 types of oil for use in the prairie provinces, was a very important event. It is the second largest Canadian lubricating oil plant, with a capacity of 70,000 gallons a day. Another important opening, at Fort William, Ont. on July 28 was that of the 5,000 barrel refinery of Husky Oil & Refining Ltd. To supply the oil industry a second multi-million dollar pipe and tube mill is expected to be announced soon by Canadian Western Pipe Mills Ltd.

The merger of big companies during the year is significant perhaps of the oil industry approaching maturity. Canadian Oil Companies Ltd. with headquarters in Toronto, was acquired the assets of Anglo Canadian Oil Co. Ltd. Exploration and oil production will now be added to its former activities. A western office is expected to be opened in Calgary. British Petroleum Co. Ltd. of London, England, has increased its interest in Triad Oil Co. Ltd., head office, Calgary, Alberta, to 50 percent by the purchase of an additional 4,800,000 shares of treasury stock of Triad. J. Grant Spratt, formerly president of Trans Mountain Oil Pipe Line Co. has been named executive vice-president and managing director of Triad. The acquisition of Federated Petroleums Ltd. assets by Home Oil Company Ltd. at present awaiting approval of the shareholders, is another move of considerable interest.

The natural gas situation appears to be approaching settlement. The U. S. Federal Power Commission has approved the importation of Canadian gas into the Pacific Northwest. This permits Westcoast Transmission Co. Ltd. to begin construction of its proposed line from northern Alberta and British Columbia to the U. S. border at Sumas, Wash., where 300 million cubic feet of gas per day will be delivered to Pacific Northwest Pipe Line Corp.

Trans Canada's troubles also seem to be waning finally. Dominion and Ontario governments have agreed to build the expensive leg of line north of the Great Lakes and lease it to Trans Canada for a period of years with the right to purchase at a later date. It now is assumed that Trans Canada will be able to complete its financing of the remainder of the line. The U. S. Federal Power Commission still presents a hurdle however, since its approval must be obtained to export gas to the Minnesota area.

Canadian Gulf Oil Co. has signed a long term sales contract with Trans Canada for one trillion, three hundred billion cubic feet of gas from the Canadian Gulf Pincher Creek field. The 25-year pact calls for a minimum of a 100 million cubic feet daily for the first year, with 170 million cubic feet daily for the years following. Recently it has been suggested that this deal indicates that Gulf may participate in the Trans Canada financing and further lighten Trans Canada's task.

Marketing Problems Multiply

There will be a tight squeeze on Alberta production this winter, as Pembina operators announced at the recent MPR hearing their intention of completing 275 more wells by February 1, raising field total to 800. Ultimate productive area of possibly 500,000 acres (6,000 wells on 80-acre spacing) again poses the long-term problem of increasing markets.

Preliminary forecast shows probable completion of drilling at close to 2,000 new oil wells in western Canada in 1955, nearly double the 1954 total, while total wells, including wildcats and developments, should reach between 2,600 and 2,700—up to 20-25 per cent over 1954. Drilling rigs at work number about 260, close to saturation.

Impression in the steel industry is that planned construction of total of five pipe and tube mills within 1956 in three western Canadian cities will be far beyond indicated market. Eastern and foreign mills may still be competitive, due to complexities of local rail freight rate structure, and market is not ahead of existing capacity.

H. M. Boles

Shell Names Toronto Division Manager

H. M. Boles has been appointed Toronto division manager of Shell Oil Co. of Canada, Ltd. Mr. Boles joined Shell in 1935 as a service station attendant and within two years was named a salesman. Since that time he has moved up steadily through the company's marketing department. In his new post, Mr. Boles will be responsible for the company's marketing activities throughout the division area in Ontario. His headquarters will be in Toronto. Mr. Boles succeeds S. C. Burnet who has been appointed sales manager for the company.

Director Named By Royalite

F. C. Manning of Calgary, president of Manning-Egleston Lumber Co. Ltd., has been appointed to the board of directors of Royalite Oil Co. Ltd. The announcement came from C. U. Daniels, chairman of the board, following the November directors' meeting.

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In 1950 the first Petreco Electrofining* Unit was installed. Now there are 18 Electrofiners installed and — at the last count — six more under construction and on order.

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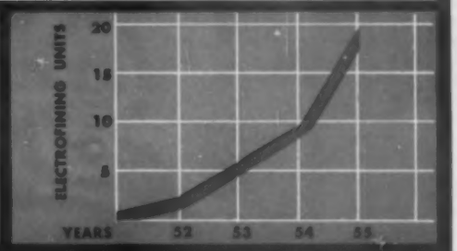

THIS TABLE SHOWS THE WIDE ACCEPTANCE AND APPLICABILITY OF *ELECTROFINING*.

ELECTROFINING INSTALLATIONS

Refinery Location	Electrofining Treatment	Number of Units	BPD Capacity	Stock Treated
California	Acid	1	16,000	Light Pressure Distillate
California	Acid	4	8,600	Lube and Spray Oils
Indiana	Caustic	1	10,000	Blended light cycle oil and straight run naphtha
Kansas	Doctor	1	11,000	Straight run and cracked gasoline
Pennsylvania	Caustic**	1	12,500	Gasoline
Pennsylvania	Caustic**	1	3,600	Gasoline
Texas	Caustic**	2	5,000	Thermally cracked distillate
Texas	Caustic**	2	5,000	Cat distillate
Texas	Caustic**	3	30,000	Cat distillate
Texas	Acid	1	4,430	Lube Oil
Texas	Sulfonation	1	2,000	Virgin distillate
Texas	Dewatering	2	6,000	Vacuum Tower Gas Oil

**Caustic Scrub and Water Wash

Additional Electrofiners are under construction or on order for refiners in Canada, Pennsylvania, New York, Ohio, and New Jersey.

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Latin American Oil News

Guatemalan Concession Rush Ended

With the issuance of the regulations to the new petroleum law, the rush for concessions resulted in 29 corporations applying for 92 concessions, swamping the government's facilities so completely that a two-month moratorium was called to study the concessions. Under the law all concession applications made until November 23 were accepted on an equal basis of priority, with provisions for allocation of overlapping areas to be made by the government.

Among the companies applying were the following, with the number following the company name indicating how many concessions were requested: Guatemalan Atlantic Corporation, 1; Tide Water, Guatemala, Ltd., 1; Sohio Caribbean Company, 3; Petroleum Investment (Overseas) Ltd., 1; The Ohio Oil Company of Guatemala, 3; Amerada Petroleum Corporation of Guatemala, 2; Inversiones Guatemaltecas-Americanas, S. A., 1; Continental Oil Company of Guatemala, 1; William Lawrence, Norman Stone, 3; Sun Production Company, 2; Halbert & Jennings, 4; Seaboard Exploration Company, 4; Archer Oil Company, 4; Shawano Development Corporation, 4; A. K. Swann, 10; Garfield & Pasternak, 10; Esso Standard (Guatemala) Inc., 3; Petróleos Guatemaltecos, S. A., 6; Bandini Petroleum Company, 1; Jaime Allan, Willard Duran, 1; Texas Petroleum Company, 2; Union Oil Company of California, 4; Compañía Petrolera California Ltd., 8; Signal Exploration Company, 4; Story J. Sloane, 4; Central American Oil and Mining Company, 1; Antonio Molina Murillo, 1; Petróleos Atlas de Guatemala, S. A., 1; Compañía Petrolera Guatemalteca, S. A., 1.

Interest Acquired In Anglo-Ecuadorian Oilfields

Lobitos Oilfields and South American Gold and Platinum Co. of New York have each acquired one-third interest in Anglo-Ecuadorian Oilfields. An agreement was recently reached between Anglo-Ecuadorian and the government for refinery construction to handle rising internal construction and relaxation of product price controls. Simultaneously, the company's concession expiration dates (it has 85 percent of production) all were extended to 1977.

Argentina—New YPF Officials Appointed

General Alfredo Intzaurgarat, who was president of Y.P.E. from 1944 to 1946, has again been placed in charge by the new Argentine government. Mr. Intzaugarat has a record of cooperation with private oil companies in Argentina and was recently in charge of the construction of a toluene plant built by M. W. Kellogg for Fabricaciones Militares. He has favored the cooperation of private capital in development of Argentine oil resources.

Mr. Federico Ramos Ruiz has been appointed technical manager of Y.P.F. He was with Y.P.F. from 1934 to 1950, in which year he resigned and was appointed general director of the State Water and Electric Power Department. He is also said to favor private participation in oil development.

These appointments seem to supplement the opinion of observers in Argentina that private foreign capital will be admitted under the new regime, possible not by contract but by passage of a new general petroleum law. The need for foreign participation and development was recently pointed out by Dr. Paul Prebisch, General Secretary of the U.N. Economic Commission for Latin America. Dr. Prebisch recently accepted a temporary position as economic advisor to the President of Argentina. His initial report on the economic situation gave as one of four reasons for Argentina's economic difficulties the failure to promote expansion of the petroleum industry, and he recommended policies conducive to increased foreign investment.

Colombia-Cities Service Contract Signed On Carare Area

Signing of an oil development contract between a subsidiary of Cities Service Co. and the Republic of Colombia's government-sponsored oil company, Empresa Colombinana de Petroleos, has been announced by Cities Service.

The contract covers 2,200,000 acres, lying between six to seven and one-half degrees north latitude and 70 to 74-¼ degrees west longitude. It is bounded on three sides by areas where there is substantial existing production. This acreage is to be developed by Cities Service in conjunction with the Colombian government company. No exploration has been carried on heretofore because the entire area has been under prolonged title litigation (since both private and governmental rights to the subsoil exist in Colombia) recently finally resolved in favor of the Colombian government.

Operations will be managed by the Cities Service subsidiary, Colombia Cities Service Petroleum Corp. This subsidiary will be entitled to 75 percent of production after royalty, and will bear 75 percent of all costs. The Colombian government company will participate in both the costs and production, to the extent of 25 percent.

The contract is unique because for the first time a nation's government-owned oil company will share with a foreign oil corporation the costs of developing that nation's oil resources.

In process of negotiation for the past nine months, the contract was formally executed in Bogota by a group of Cities Service officials headed by Burl S. Watson, president, and by the head of Empresa Colombiana de Petroleos, Dr. Francisco Puyana Menendez.

In announcing the contract, Mr. Jones said: "Cities Service welcomes the opportunity of participating, with Empresa Colombiana de Petroleos, in the development of the oil resources of our friendly neighbor to the south, the Republic of Colombia. Our relationships with the officials of Colombia have been most cordial and we look forward to working together for the mutual benefit of the Republic and of Cities Service."

In a statement issued to the press in Bogota, Dr. Menendez stated: "We consider this contract as the best of all Christmas presents for our country. It is a present whose value for Colombia cannot be calculated."

Geological and geophysical experts will be sent into Colombia immediately, according to the company, and developmental work will be well under way early in 1956.

Creole's Role In Venezuela Studied

The story of the Creole Petroleum Corp. in Venezuela is told in a case study by the National Planning Association. The study, fourth in the NPA series on "United States Business Performance Abroad", views Creole's role as a good one, saying:

"It is a story practically devoid of the kind of 'exploitation' that some propagandists would automatically associate with large and powerful companies dealing with a relatively small and underdeveloped country. It is also a story that does not support the contention that extractive industries 'leave nothing behind them but a hole in the ground'. In place of exploitation, there have been rising standards of living and of health, considerable educational progress, and, hopefully, the gradual evolution of stable and democratic political institutions."

Peruvian Exploration Bids Closed In The Montana

Seven U.S. and two Peruvian companies have qualified for bidding on acreage over the 2,470,000-acre limit they each now hold in the Montaña region of eastern Peru. By Supreme Decree 2 further bids have been closed and qualified companies have until January 16, 1956 to present bids and final decision will be announced 30 days after the auction.

Japanese Firm May Explore In Bolivia Under New Law

The Teikoku Oil Co. Ltd. of Japan is to send two representatives to Bolivia to make a reconnaissance survey, following which the company may engage in petroleum development. Reports indicate the company may operate jointly with Yacimientos Petroliferos Fiscales Bolivianos, the Bolivian government's company, which until recently had a virtual monopoly over the entire country.

Operations in Bolivia have been stimulated recently by the passage of a new petroleum law which is considered quite liberal and favorable to operations by foreign companies.

A summary of Bolivia's new petroleum code, which outlines the terms available to private investors in Bolivian oil fields, was recently made public by Victor Andrade, Ambassador of Bolivia.

"The new code is specifically designed to attract foreign investment in our oil resources," the Bolivian Ambassador said. "It's terms compare favorably with the concessions offered by any other country in Latin America and elsewhere in the world. All indications are that Bolivia's oil resources are tremendous and will require funds and technical resources which are beyond our capacity at present. We are anxious, therefore, to share the development of our wealth with outside capital in a manner which will be beneficial to all concerned."

The new regulations offer up to 50 years' concessions to private persons or organizations interested in the exploration and development of oil properties or in the refining, manufacturing, transportation and exportation of oil products. The concessions confer exclusive rights of exploration and subsequent exploitation and may be acquired by anyone providing evidence of technical and financial capacity to handle them properly. They include:

1. A depletion allowance of 27 percent per year of the gross value of petroleum and natural gas.
2. Amortization of capital at the rate of 20 percent annually.
3. Areas for exploration and subsequent exploitation, or for direct exploitation, of up to 3,000,000 hectares (approx. 7,410,000 acres), depending on geographic location.
4. Exclusive concessions for the purpose of exploration will be made for periods up to 10 years; concessions for direct exploitation, up to 40 years.
5. Exemption of all necessary machinery, equipment, tools and materials from import duties and fees.
6. Exemption of exports of petroleum, derivatives and petroleum products from export taxes and controls.
7. Freedom to convert receipts from capital investments, or the sale and exportation of petroleum products, into dollars, or the currency in which the investment was made.
8. Liberal tax deductions and a fixed annual income tax not in excess of 30 percent of net profits.

Under the new Code Bolivia is divided into three geographic zones. Concessions available for immediate exploitation range from a minimum of 1,000 hectares (approx. 2,470 acres) to a maximum of 375,000 hectares (approx. 926,000 acres). Areas for exploration and subsequent exploitation range from a minimum of 5,000 (approx. 12,350 acres) to a maximum of 750,000 (approx. 1,853,000 acres) hectares. Concessions up to 3,000,000 hectares (approx. 7,410,000 acres) may be granted for combined exploration and direct exploitation operations.

The Code also provides for the formation of joint companies in the area now reserved for Y.P.F.B., the government oil corporation.

Depending on the zone selected, the minimum annual investment per hectare (1 hectare equals approximately 2.47 acres) required under the Code varies from 20 to 80 cents. Other important *financial* obligations of the concessionaire include: (1) Payment of an annual surface exploration tax of two to five cents per hectare, depending on the zone selected; (2) Payment of a royalty, subject to reduction, equal to 11 percent of the crude oil and other products obtained from the concessions; (3) Payment of an initial exploitation tax of 20 to 40 cents per hectare; depending on the zone selected, plus an annual exploitation surface tax from which the amount of the royalty may be deducted.

The code also specifies that 70 percent of management and 15 percent of workers may be foreign personnel.

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Magcobar G-7 Super-Weight is a finely ground product with an unusually high specific gravity (7.0) and is suited for preparation of extremely high weight muds in the range of 26-32 lbs./gal. It has a particle size of 70% through 325 mesh. It is a charcoal colored free-flowing powder which is easily mixed through a jet hopper mixer.

G-7 Super-Weight muds can be used under these or similar conditions:

a. Working over high pressure wells, in which tubing or casing failure has occurred relatively near the surface.

b. Emergency situations in drilling wells, where a critical mud weight balance exists between an upper loss zone and a lower high pressure zone.

c. Blow-out wells, in which the normal blow-out prevention procedures have failed or are not economically practical.

The preparation of special high weight muds with Magcobar G-7 requires considerable care in that a balance between support of weighting material and viscosity for pumpability must be maintained through the correct quantity of low gravity solids.

MAGCOBAR G-7 IS NOT RECOMMENDED FOR USE IN THE NORMAL DRILLING OPERATION. If you have an emergency drilling condition that cannot be safely controlled with regular 20 lbs./gal. Magcobar muds, it is recommended that you contact your Magcobar field engineer for specific study and recommendations for your problem. A stock of Magcobar G-7 is maintained at New Orleans, Louisiana, and is available from this stock through all Magcobar dealers.

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Gulf Research Finds Why Cars Stall

Carburetor icing has been the chief cause of automobile stalling during cold, damp weather within recent years, Gulf Oil research laboratories have established.

The conclusion results from a comprehensive road test program in which over 100 cars of all makes, using representative gasolines, were driven in cool season weather conditions.

Under conditions most conducive to this happening, namely at temperatures from 35° F. to 45° F. and at humidities of 75 per cent upwards, the Gulf Oil laboratories found that 55 per cent of all the cars tested stalled from carburetor icing when driven from a cold start. Carburetor icing was shown to persist as a problem (although lesser at the outer limits) through the full temperature span from 30° F. to 55° F. and in humidities from 60 per cent upwards.

Vitro Acquires Tulsa Refinery Company

Refinery Engineering Co. of Tulsa, Okla., will become a wholly-owned subsidiary of Vitro Corp. of America, together with its Canadian subsidiary, Refinery Engineering Ltd., of Toronto, Ont., and a partnership, The Refinery Engineering Co., also of Tulsa. The price to be paid by Vitro for Treco, as it is known in the engineering business, was not disclosed, but it is believed to be between 2 and 3 million dollars, a substantial part of which will be in Vitro common stock.

New Filtration Method

The cost advantages of No. 6 fuel oil can be realized in gas turbines as a result of a new, economical filtration method, development of which has been sponsored by General Electric Co., it was reported at the diamond jubilee annual meeting of The American Society of Mechanical Engineers, held in Chicago.

Copies of the paper, #55-A-121, can be obtained at 50¢ each from Order Depts., ASME, 29 W. 39th St., New York 18, N. Y.

Field Test Worthington Completes 2-Year

Hellmuth Walter, director of research for the Worthington Corp., has announced the successful completion of a two-year field test of a new method of oil recovery in which Worthington has been engaged. The test, conducted in cooperation with the Forest Oil Corp. of Bradford, Pa., was completed in a shallow field in southeastern Illinois. The field contained highly viscous oil previously considered unrecoverable by any known methods, since the bottom temperature of the field—around 50 to 60 degrees F.—was too low to allow the heavy oil to run freely or be driven out of the sandy rock and other natural formations.

Special equipment was designed, engineered, and built by Worthington for the job, with company engineers participating in the field operations. According to Mr. Walter, a universal pilot test plant was developed which allows the driving and reactive agents to be changed according to geological conditions and the viscosity of the crude. Driving agents were hot combustion gases and steam, with hot air used as exidizer for underground combustion.

Midget "Atom Smasher" Passes Test

The world's smallest "atom smasher" recently passed its first successful test in radioactivity well logging by Well Surveys, Inc., affiliate of Lane-Wells Co., Tulsa, Okla. Its perfection is one step in the application of atomic energy to oil field problems begun by the company nearly 20 years ago.

The unique neutron generator, incorporated in a standard 3⅝ inch well logging assembly, is itself only 3 inches in diameter and 47 inches long, yet it provides the most intensive beam of neutrons ever used in a well. The device actually is a miniature version of a Van de Graaff particle accelerator, a large radiation-generating machine long used for physics research, cancer therapy, and more recently for chemical processing and sterilization.

Road Test Demonstrates Oil Performance

Details of a road test showing superior engine cleanliness, due to the use of a lubricating oil with a new type dispersant, were presented to the National Fuels and Lubricants Meeting of the Society of Automotive Engineers in November by R. I. Potter, formerly of the manufacturing department of the Standard Oil Co. (Ohio), and now with the Ford Motor Co.

The road test, sponsored jointly by Sohio and Du Pont, was based on the operation of thirty taxicabs driven 50,000 miles each and demonstrated the performance of ten oils containing a variety of types of additives and concentrations in the same base oil. Resulting data, also supported by laboratory tests, show that oils vary widely in their ability to prevent sludging under low duty operation.

R. H. Albrecht of Sohio's manufacturing department, and Kent Hyatt of Du Pont's petroleum chemicals division were co-authors with Mr. Potter of the Sohio-Du Pont report, which represents the first complete data to be released publicly.

Ingram Oil Plans New Installation

Southwestern Engineering Co., Los Angeles, has been awarded a contract for the construction of new facilities at the Meraux, La., refinery of Ingram Oil & Refining Co. It is expected that the new facilities will be completed by April, 1956.

The new installation will include a 3,000-barrel-per-day platformer, licensed by Universal Oil Products Co., as well as prefractionation and light straight run gasoline stabilization facilities. Estimated cost will be approximately $1,000,000. The platformer, which is being added to produce high octane premium gasoline from low grade straight run and distillate stocks, is designed with sufficient capacity to permit the ready addition of Rexforming extraction facilities in the future.

A.P.I. Honors Oil Consultant

Special tribute was paid to John R. Suman, of Houston, Texas, at the 35th annual meeting of the American Petroleum Institute in San Francisco. Suman, who retired last spring as a vice president and director of Standard Oil Co. (N. J.), and is now operating as a consultant in the Gulf Southwest, was honored by the Institute's division of production on November 15 and given a special award in recognition of his many years of brilliant leadership in the API's standardization program. So effective has been this program that oil production equipment is now manufactured internationally and interchangeability is assured.

New Seismograph Combines Three Systems

Southwestern Industrial Electronics Co., Houston, Texas, has announced the new G-33 Full-Spectrum Seismograph System, which combines in one instrument all the functions previously filled by three separate seismograph systems. Since it covers the seismic spectrum over the entire range of frequencies from 4 to 600 cycles-per-second, the G-33 can be used for refraction, conventional reflection, and high-frequency recording with no additional equipment required. Filtering covers this wide-band with two attentuation rates for both high and low frequency cuts. Automatic gain control time-constants are provided for each recording technique. A variable speed oscillograph allows the use of the same instrument in all three applications.

Lane-Wells Administrative Changes

John J. Neale, president of the Lane-Wells Co., one of the Dresser industries, announces a general reassignment of the administrative duties of the company's top-level executives. Included are the following changes: James D. Hughes, formerly vice-president, sales, will now direct sales and service activities. K. H. Miner, former vice-president of Petro-Tech Service Co., a Lane-Wells foreign subsidiary, assumes the assignment of acting manager-engineering, manufacturing and purchasing. R. W. Keener, formerly vice-president of Petro-Tech, is now manager of foreign sales and service.

Ball Adds To Staff

Alan M. Bieber, former independent geologist, Richard H. Fulton, formerly with Midstates Oil Corp., and Alexander S. Wyner, former mining engineer and geologist, have joined the staff of Ball Associates, with offices in Washington, D. C. and Denver, Colo. The firm also announced the opening of its new offices at 210 C. A. Johnson Bldg., Denver.

Royalty-Free Licenses Offered

John Maher, president of Oil Center Tool Co., Houston, has announced that the company is offering manufacturing rights for dual completion wellhead equipment under its patent No. 2,335,355 to all valve and wellhead equipment manufacturers on a non-royalty basis. Mr. Maher stated that O-C-T is offering these manufacturing rights because the company believes that the oil industry is entitled to the full benefits of dual completion equipment and that oil operators should be at complete liberty to specify the valves and other component equipment of their choice used in this type assembly without paying a royalty bonus.

New Tulsa Building For Shell Oil

Plans for the construction of a new 10-story building in Tulsa which will serve as headquarters for Shell Oil Co.'s Tulsa area operations were announced recently by the Sunflower Corp. Construction of the two-million dollar structure, to be known as the Shell Building, will begin approximately January 1 and is expected to be completed by June 1, 1957.

New Type Muffler Developed

According to William Clayton, president and founder, the Clayton Manufacturing Co. (El Monte, Calif.) has developed a new muffler for automotive engines, which eliminates more than 95 per cent of the hydrocarbons passed into the atmosphere from unburned and partially burned fuel. Development work already is under way on models for several popular makes of passenger cars and for certain types of Diesel-powered equipment. Several months will be required, however, before any of the smaller mufflers will be available to the general driving public.

In the new Clayton muffler, which embodies a principle different from anything now on the market, the stream of exhaust gas from the engine sucks in sufficient air (oxygen) to cause combustion of the unburned or partially burned fuel carried into the exhaust system during the normal operation of the engine. Means are provided for positive ignition of the unburned gases.

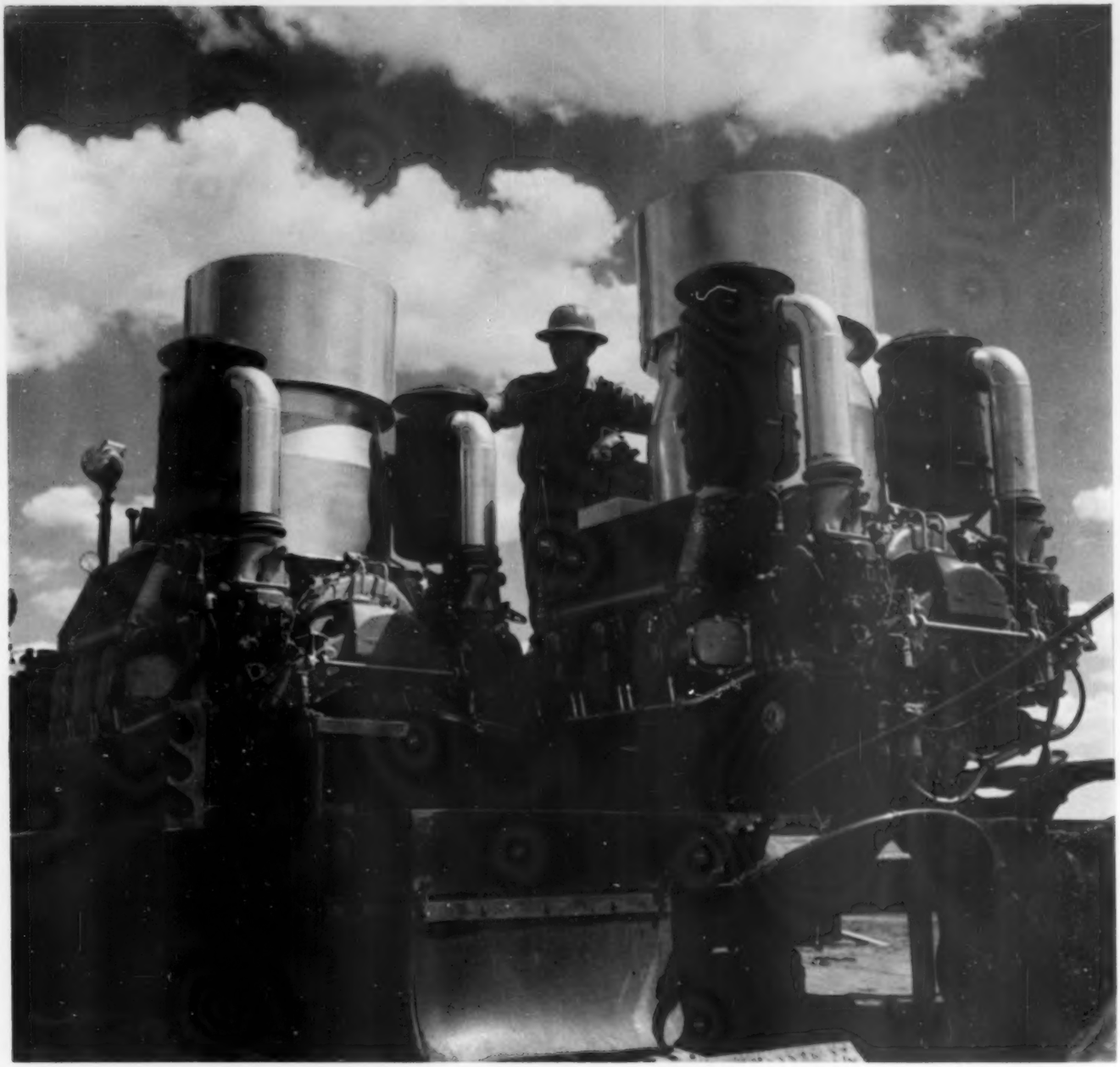
Several of the new mufflers are in service on buses operated by the Los Angeles Transit lines, the Portland (Oregon) Traction Co., Long Beach Motor Bus Co., Los Angeles School district, Tanner Motor Libery, and the Metropolitan Coach lines.

Plans New Price Policy

Standard Oil Co. (Indiana) announced on December 1 that it is making plans to sell gasoline to commercial customers in tank car or transport quantities at delivered prices that will be the same as its prices to jobbers. It is planned to put this price policy into effect not later than January 1, 1956, Dwight F. Benton, vice president in charge of sales, said. The necessary preparatory work with regional and division managements is now under way.

Texan Corporations Merge

Texas Eastern Production Corp. has been merged with and into Texas Eastern Transmission Corp. Under the terms of the merger agreement, Production shares will be converted into shares of Transmission common stock at the rate of 2.6 Production shares for one share of Transmission common stock. Immediately after the merger was made effective on November 30, formal notice was sent to the record holders of Production Corporation stock, together with a form for their use in the transmittal of shares for exchange.



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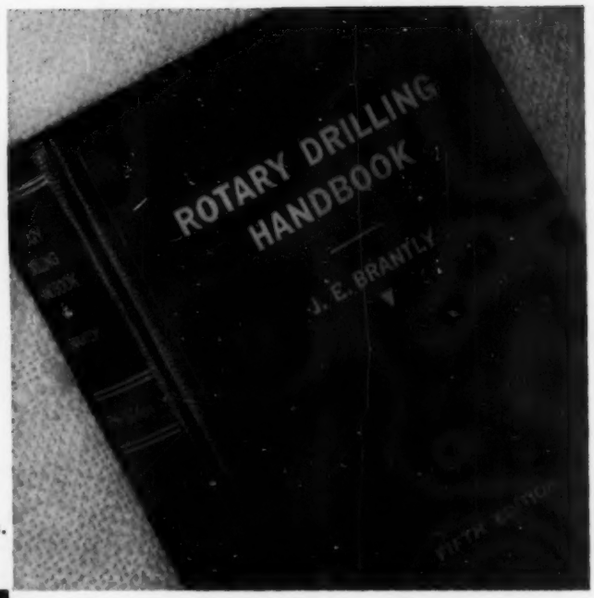

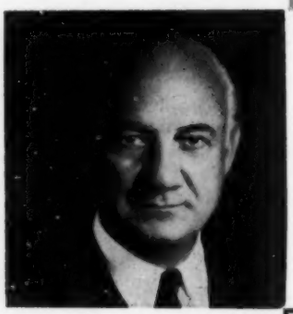

Discoveries and inventions, improved techniques and new equipment required a complete re-writing of this standard authoritative work. All tables, *filling 206 pages*, have been re-checked, revised, and expanded. New tables have been added.
A glance at the Table of Contents will show the scope of the treatment provided in this 702 page book. There are 206 pages of tables, a glossary, illustrations, charts and diagrams.

J. E. Brantly, past president, American Association of Oilfield Drilling Contractors and president of Drilling & Exploration Company, a distinguished authority on all phases of rotary drilling who has operated in most of the oil producing countries of the world, has revised all the chapters, in many cases completely re-writing them. New chapters have been added, notably one on Straight Hole Drilling by Don K. Weaver.

Other experts in some of the more highly specialized divisions have assisted Mr. Brantly in giving the most authoritative treatment this subject has ever had.

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GLOSSARY, ILLUSTRATIONS, TABLES AND FORMULAS

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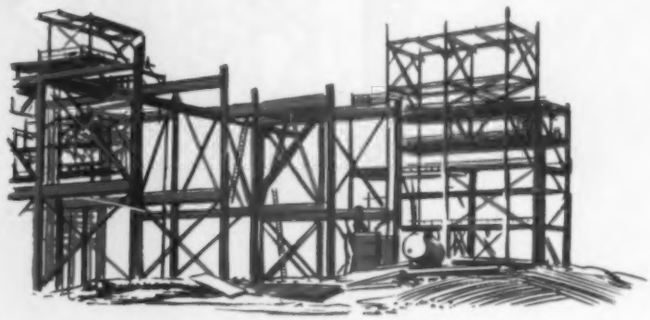

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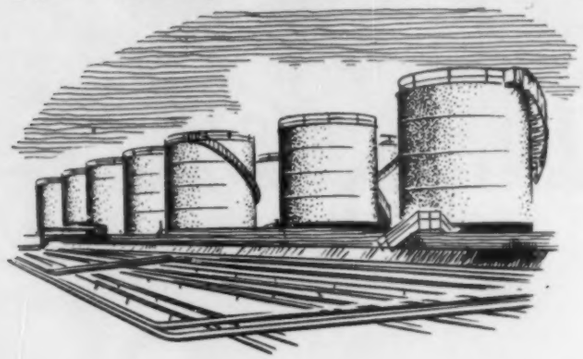

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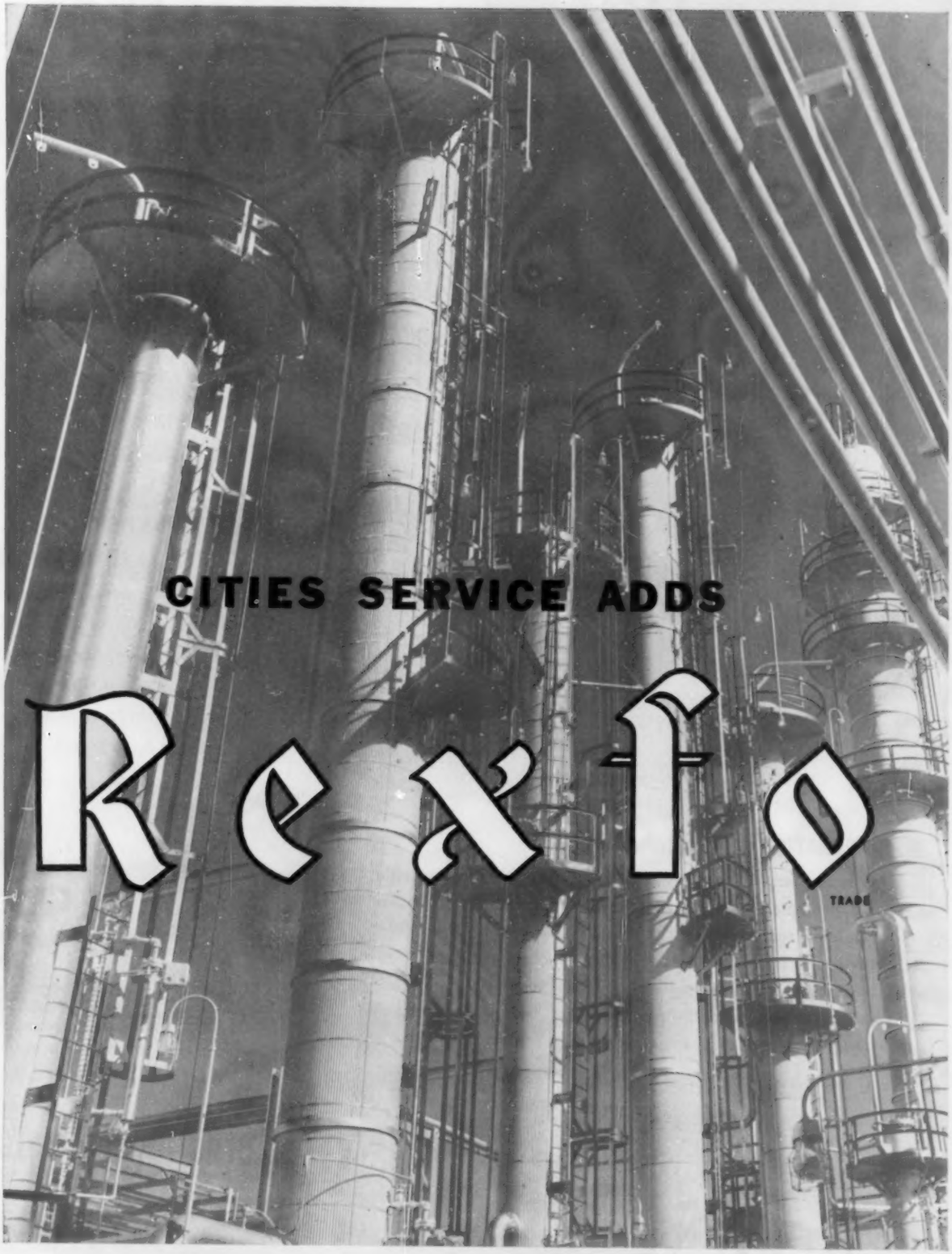
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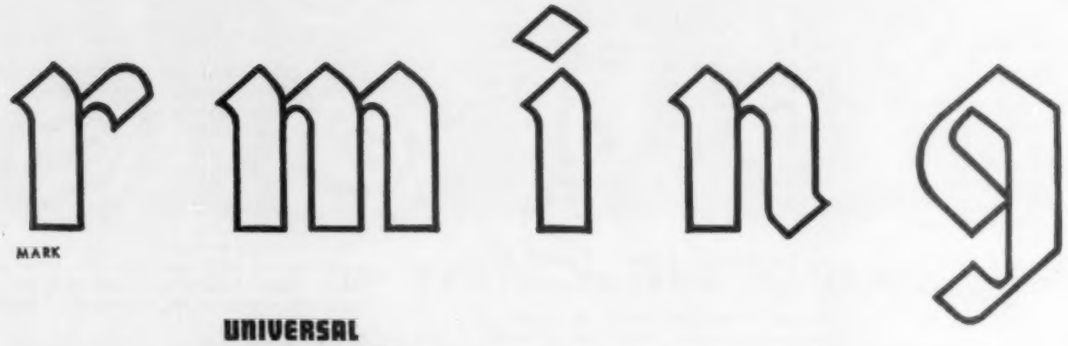
After an exhaustive study, Cities Service Oil Company (Del.) has chosen the UOP Rexforming process as the best method for upgrading low octane naphthas to meet the rapidly increasing demand for higher octane gasolines.

A 6,000 barrel per stream day Rexformer will be installed at Cities Service Ponca City, Okla., refinery as an important part of an extensive new construction and expansion program.

By installing the Rexforming process, the latest development in the catalytic reforming field, Cities Service will be assured of obtaining the best yields of the highest octane blending material for the company's motor fuels. Rexforming, developed by Universal, is capable of producing gasolines having octane ratings considerably in excess of 100 clear.



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International News and Notes

New Refinery For Finland

Final plans have been announced for a new 17-million-dollar petroleum refinery to be constructed near Turku, Finland, for Neste Oy by the Lummus Co., New York engineering and construction firm. The normal capacity of the refinery will be 17,000 BSD, but it will be able to handle up to 19,000 BSD of heavy crude.

The refinery will consist of an electrical desalting unit; atmospheric and vacuum distillation unit; Atlantic catalytic reforming unit (Catformer) with a total charge of 3,400 BSD; Socony Mobil Thermofor catalytic cracking unit with a fresh feed charge of 6,000 BSD; California Research Corp. catalytic polymerization unit to produce 500 BSD of polymer gasoline; asphalt vacuum and oxidation unit to produce 1,300 BSD of paving-grade asphalt with facilities for hot process bagging. There will also be the necessary units for vapor recovery, solid copper chloride sweetening, and double caustic and inhibitor treating.

The new refinery, which will supply a substantial part of Finland's petroleum requirements, is being designed to handle crude from the Middle East as well as from the Black Sea area.

New Costa Rican Well For Union Oil

Joel Lloyd, manager of Union Oil Co.'s subsidiary, Compania Petrolera de Costa Rica, reports that a new well, Cocoles #1, will be drilled approximately 13 kilometers northwest of the present Bris #1 well near the border of Panama close to the Caribbean. The new well will be spudded in within 30 days and is only awaiting the completion of an access road through the dense tropical jungle area. Mr. Lloyd states that drilling continues on Bris #1 and that on November 7 they had reached 6,500 feet.

Lebanon Refinery Adds Second Platformer

The start-up of a second UOP platforming unit at the refinery of the Mediterranean Refining Co. in Sidon, Lebanon, will increase the refinery's crude throughput from 6,250 BPCD to 9,000 BPCD. The Platformer, designed and licensed by Universal Oil Products Co., is a duplicate of the one which went on stream earlier in 1955 and the third one in operation in the Middle East.

Indian Government To Explore Assam

Exploration for oil in areas of Assam, India, is expected to begin following talks between representatives of the Assam Oil Co. and the Minister for Natural Resources. They are understood to have discussed general questions concerning the formation of an Indian oil company by the Government in partnership with Assam, along lines announced earlier. The company is to be formed by the end of March, 1956, it is reported.

Representatives of Assam Oil, it is learned, have asked for additional licenses to carry out exploratory drilling and such operations have already begun in the Hugrijan area, for which purpose they recently received a prospecting license.

Iraq Petroleum Spuds In

Iraq Petroleum Co. Ltd. has spudded in a wildcat at Jebel Fahud in the Sultanate of Muscat and Oman. Fahud is located at about the junction of the 65° longitude and 22° latitude E, about 100 miles southwest of the Oman Mountains and on the northeast side of the Rub al Khali (empty quarter). Drilling equipment was transported from Unn Said in Qatar to Fahud by plane as overland transportation is almost impossible.

Lebanon Investigates U. S. Petroleum Operations

Officials of Lebanon, which wishes to develop a crude petroleum industry, are checking into the facts of petroleum operations in the U. S.

At present, their interest is in finding details of (1) contracts concluded in the United States between oil producing companies and pipeline companies for the transportation of oil; (2) service charges paid by oil producing companies to pipe line companies; (3) fees and taxes collected by the city, state, and federal governments from both the oil producing companies and the pipeline companies.

New Zealand Oil Shares

The New Zealand Government is selling its shareholding in The British Petroleum Co. of New Zealand to The British Petroleum Co. Ltd. The Government holds £NZ 1,275,000 shares of £NZ 1 each (51 per cent of the capital, the remaining percentage being held by BP). The sale price of these shares will be £NZ 1,275,000. BP of New Zealand needs additional capital to finance development of its operations and the Government has decided to withdraw completely from the company.

U. S. Equipment To Israel

Orders for $2,500,000 worth of oil drilling equipment have been placed in the U. S. for two Israeli companies, Israel Water Works, Ltd., Tel Aviv, and Matzada Co. The orders call for delivery of four rigs within the next two months and were placed with Ideco, a division of Dresser Equipment Co., Dallas, Texas, by Israel Purchasing Service, Inc., New York City, commercial arm of Ampal-American Israel Corp.

Two types of rigs will be shipped, one each to the two companies: the Ideco H-525 rotary torque-converter rig with a 133-foot Full View mast for depths to 7,000 feet; and the Ideco H-750 with a 143-foot mast for depths to 9,000 feet. Both types have a 4½ inch drill pipe and are air-controlled.

Matzada is a drilling company set up as a joint venture by Lapidoth and Israel Oil Prospectors Ltd., the two companies who brought in Israel's first discovery well at Heletz last September.

To Install Atomic Power Plant For World Fair

Belgian private enterprise will install an atomic power plant to provide electrical energy during the Brussels World's Fair in 1958, according to an announcement made in New York by William E. Knox, president of Westinghouse Electric International Co. Simultaneous announcement was made in Brussels by H. Robiliart, chairman of the Syndicate d'Etude de l'Energie Nucleaire, an organization of Belgian utilities and manufacturers formed recently to develop industrial uses of atomic energy in Belgium. The 11,500 KW plant will be the first completely privately-financed atomic-electric power plant to go into operation anywhere in the world. It will be built within a few miles of the center of Brussels. Work on the project is already under way in Belgium and the U. S.

New Strike in Italy

The well, Madonna della Croce, which was spudded in on August 25, 1955, about 220 yards west from the boundary of Petrosud's Abruzzi concession, has struck oil at about 2,100 feet. The well was drilled by Somicem, a subsidiary of Eni, the Italian state oil corporation. It would appear, from its close vicinity to Cigno No. 1 well of Petrosud, that the new strike is an extension of the field.

D. D. Feldman

Feldman To Launch Expansion Program

D. D. Feldman Oil & Gas, Dallas, Texas, has announced that an expanded oil and gas prospecting program in Europe and the middle eastern countries will be launched in the near future if present plans materialize as expected. Headquarters for the foreign operation will be in Paris, where an office has been established. Other company offices are in Dallas, New York, Houston, Los Angeles, Lafayette, La., and Midland, Texas.

Extensive operations have already been launched in Turkey, where the firm is one of three granted clear permits to prospect for oil. There was a total of 187 applications for permits. The other two successful companies are Standard Oil (N.J.) and Turkish Petroleum Co.

In Dallas, Mr. D. D. Feldman, president of the company, said that his company has made application for eleven areas, with three claims already granted. The other eight areas are in conflict with other companies. These differences will be resolved at a meeting to be held in Ankara in December.

Eastern Cuba To Get Refinery

The Texas Co. began construction in November on a 20,000 b/d refinery at Santiago de Cuba. It is expected that the refinery, the first to be built in eastern Cuba, will go on stream early in 1957.

The 400-acre site for the new plant is on the west side of the deep-water harbor, about three miles south of Santiago de Cuba. It is estimated that the refinery will cost in excess of $14,000,000.

Augustus C. Long, president, said one reason for the company's decision to build in Cuba was the promulgation of Decree-Law No. 1758, published in the *Official Gazette* of November 4, 1954, and designed to encourage the investment of foreign capital in Cuba.

Siboney's Cuban Concessions

Siboney Development and Exploration Co. will acquire a full working interest in the 5,000,000 acres of Cuban concessions now held jointly with Caribbean Petroleum Associates, Inc., under the terms of an agreement signed in New York recently for submittal to respective stockholders. Siboney was originally obligated to Caribbean to do certain exploratory work over a four-year period in order to earn a half interest in Caribbean's concessions. Under the new agreement, Siboney acquires full working interest immediately and is relieved of all obligations to Caribbean for a total consideration of 2½ million shares of Siboney and $250,000 in cash.

Siboney's concessions cover strategically located acreage in Oriente Province at the eastern end of the island, in the central provinces, and in the shallow offshore areas, including the Gulf of Batabano which lies between Havana Province and the Isle of Pines. It is anticipated that Siboney's first exploratory well will be started shortly. It will be located in Camaguey Province near Cuba's south shore.

BP TESTS IN THE SAHARA

DRIVING an average of a thousand miles a day for sixteen days, a team of technologists from the BP Sunbury Research Station has been testing specially blended fuels and lubricants to assess performance in hot climates. On desert tracks in the Sahara. On steep climbs in the Atlas Mountains. At high speeds. In gruelling temperatures up to 110 degrees in the shade.

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BP Joins In New Zealand Oil Search

The British Petroleum Group, through its wholly owned subsidiary, D'Arcy Exploration Co., Ltd., has entered into an agreement to participate in the program recently announced on oil exploration in New Zealand by the Shell Group and Todd Brothers Ltd. Prospecting licenses in the Taranaki and Rangitikei area (in the central and western districts of the North Island) are held by Todd Brothers Ltd. and the Shell Group, and exploration is to be carried out by the recently formed Shell D'Arcy Todd Oil Services Ltd. The initial exploration program calls for the expenditure of not less than £1,000,000 (US $2,800,000), half of which will be contributed by BP.

Procon Ltd. Moves Headquarters

Procon (Great Britain) Ltd., an affiliate company of Procon Inc., of Des Plaines, Ill., has moved its headquarters in London. Formerly at 112 Strand, the company expansion necessitated moving to larger quarters at Bush House, Aldwych, London, W.C. 2. Both companies are engaged in process construction for the chemical, petrochemical and petroleum fields.

BP Oil Search On In Gambia

The British Petroleum Co., Ltd. has announced plans to search for oil in Gambia, British colony and protectorate on the West Coast of Africa. As a first step, a waterborne seismic survey of more than 200 miles of the River Gambia was started last month, it is reported. The survey will be conducted from the vessel "Sonic" which was engaged in similar work earlier this year on behalf of BP and Compagnie Francaise des Petroles in water off Abu Dhabi and Dubai in the Persian Gulf.

Russian Oilmen Visit Assam Oil Industry

Three Soviet oil technicians were among the party of Russian visitors in Digboi during December. The Russian oilmen are specialists in petroleum geology, geophysics and drilling. They were accompanied by interpreters and two senior Indian officials of the Geological Survey of India during their five-day stay. Meanwhile, it has been announced by the Assam Oil Co., which played host to the Russian oilmen, that its ninth and tenth exploratory wells at Nahorkatiya, in upper Assam, have been completed dry at 10,950 and 9,775 feet respectively. The company will continue its drilling operations. The drilling rig from Well No. 9 is being moved to the site of a new Nahorkatiya well—No. 13. Meanwhile, Nos. 11 and 12 (Naholia) are drilling ahead.

United Kingdom Refinery Runs

According to estimates from the Petroleum Information Bureau of London, refinery runs in the U.K. will total about 29 million tons, or about 580,000 b/d during 1955 This is nearly nine times higher than 1947 levels, which were under three million tons.

Contracts Let For New Santiago De Cuba Refinery

The Texas Co. has awarded four contracts for the construction work on its new 20,000 b/d refinery at Santiago de Cuba. The contract for designing, furnishing of materials and erection of the operating units, utilities and miscellaneous refining facilities has been awarded to Procon, Inc., of Des Plaines, Ill. The Chicago Bridge and Iron Co. (N.Y.) has been awarded the contract for furnishing and erecting tankage amounting to a total of 1,440,000 barrels. The Frederick Snare Corp., of N. Y. and Havana, has been given the contract for furnishing materials and construction of both temporary and permanent docks. Compañia Constructora Tres Piedras, S.A., Santiago de Cuba, has been awarded the contract for grading and the clearing of the plant site.

The refinery facilities include a 20,000 b/d crude distillation unit, a catalytic reformer for production of high-octane gasoline, a hydro-treating unit for production of high quality middle distillates, and a gasoline sweetening plant. The reformer will have a capacity of 3,300 barrels per operating day, and the hydro-treating unit will have a capacity of 4,100 barrels per operating day.

German Consumption Up 27.2 Percent; Refining Runs Up 11.5 Percent

Previous estimates of consumption in western Germany have had to be revised upward, since consumption during the first half of 1955 was a surprising 27.2 percent above the comparable period in 1954. Total inland consumption for 1955 is estimated at 9,491,000 tons, plus 1,420,000 tons of foreign bunker consumption. This is projected to rise to 14,196,000 tons of inland consumption in 1960, plus 1,795,000 tons of foreign bunker consumption, or a rise of around 46.6 percent. The largest increase is predicted for residual fuel, whose share of inland consumption will rise from 21 percent in 1955 to about 28.5 percent in 1960.

During 1956, consumption is estimated to rise 16.2 percent over 1955 levels, to about 11,550,000 million tons. Of this crude, 29.3 percent will come from domestic sources; the remainder will come 46.3 percent from Saudi Arabia, 25.3 percent from Iraq, 14.4 percent from Kuwait, and 3.4 percent from other Middle Eastern countries. The remainder will come 9.0 percent from Venezuela and 1.6 percent from Mexico.

Arab League Committee Meets In Oasis Dispute

The Buraimi oasis dispute continues, with Prince Feisal, Premier of Saudi Arabia, calling a meeting of the Political Committee of the Arab League in Cairo for consideration of the question. Saudi Arabia warned Britain that she could not be responsible for violence in the area, and in a concurrent announcement threatened to lay the matter before the U.N. Security Council. Lord Home, the British Secretary of State for Commonwealth Relations, described the occupation of the oasis by Britain as fulfillment of Britain's treaty relations with the Sultans of Muscat and Abu Dhabi states. He denied that Saudi Arabia was being punished for her alliance with other Arab states in the Israeli question and said that the question of oil in the region was not at issue since any oil discovered was the property of the states involved, not of Britain. At the same time, Saudi Arabia announced that no concessions granted over the area would be recognized.

Italy Grants Permission To Produce Gulf Wells

Petrosud, the Gulf and Montecatini company, has been granted permission by the Italian Government to produce a limited amount from the recently discovered wells designated as Cigno #1 and #2. These wells were reported last spring as producers of about 2,000 b/d potential, but were shut in because Petrosud's exploration rights did not contain any guaranteed right of conversion to exploitation concession. The government company received permission to produce 15.

Meanwhile, debate progresses on the new Italian law, which has called for a 60-40 profits split and which is opposed in this particular by Gulf and the other interested companies. The Government has meanwhile announced no new permits for exploration or development will be granted, pending passage of the law.

Another strike was reported in Italy, the fifth since discovery of the Cigno wells and the third to be attributed to Somincen, the government's company. This well, known as Madonna della Croce #1, is located about one mile from Vallecupa #1, the original government discovery on the Adriatic coast near Pescara. Producing formations are located at 1,960 feet depth, and the field is considered an extension of the Cigno field discovered by Petrosud.

Esso Plans 30,000 B/D Refinery In Finland

A/S Norske Esso, an affiliate of Standard Oil Co. (N.J.), has announced tentative plans for the construction of a 30,000 b/d refinery in Finland. This announcement followed one in October that the State-owned refining company, Neste Oy, will construct a 700,000-ton yearly refinery for completion during 1957.

Cities Service Wildcat In Dhofar Reaching Maximum Depth

Cities Service Co. has announced that its stratigraphic test, Dauka #1, is approaching the 12,000-foot level where present plans call for it to be abandoned. The well was drilled in an area in Dhofar on which geological information was very scanty, but the results to date, while not providing any oil shows, are not discouraging. This entire area of the Dhofar province of Muscat and Oman was formerly covered by an IPC concession which expired in 1951.

The operating company is Dhofar-Cities Service Co. and a recent announcement indicated that the rig from this well will be moved to a location 75 miles east and slightly south of Dauka #1 during early March.

Japanese Firm To Enter Bolivia Under New Law

Reports from La Paz indicate that Teikoku Oil Co. Ltd., of Japan, is sending two engineers to make a preliminary survey, after which the company may enter into exploration with Yacimientos Petroliferos Fiscales Bolivianos, the Government's oil agency.

Bolivia recently passed a law encouraging the investment of foreign private capital, with terms substantially the same as those in the Peruvian Montaña region although the structure of the law itself is similar to that of Venezuela. Provisions include unrestricted remittance of profits and capital invested and the law is considered generally favorable to operations by foreign or other private companies.

The law was passed with the aid of Wortham Davenport, formerly of Standard Oil Co. (N.J.). It divides the country into four zones. Maximum exploration concession area per person or company is 1.5 million acres in Zone 1, 3.75 million acres in Zone II, and 7.5 million acres in Zone III, with one area reserved to the government. Exploitation concessions are limited to half these areas. Duration of exploration concessions is four years in Zone I, four years plus two years' extension in Zone II, and six years plus two extensions of two years each in Zone III. Duration of exploitation concessions is 40 years.

Minimum annual exploration investment ranges from 32 U.S. cents per acre in Zone I to 20 cents in Zone II, and 8 cents in Zone III. Annual surface exploration taxes per acre are 2, 1.2, and 1 U.S. cents respectively. Exploitation concessions have a drilling obligation of about 15,000 feet per 247,000 acres held during the first seven years. Annual surface taxes range from about 22 to 60 cents per acre in Zone 1, 16 to 30 cents in Zone II, and 12 to 20 cents in Zone III. Royalty is 11 percent, reducible to 7½ percent in Zones II and III, payable in kind or in cash and deductible from surface tax. Depletion allowance of 27½ percent of gross to 50 percent of net is given. Taxation is based on the 50-50 profit-sharing after deductions of depletion, exploration, and intangible drilling and development costs. Surrender and refining privileges are contained.

Chief Engineer Dies

A. B. Johnson, former chief engineer of The Ohio Oil Co.'s pipe line department, died Saturday, November 26, of a heart attack. He had been hospitalized for two days. Mr. Johnson rose from assistant chief engineer for the company's Wyoming pipe line division (Casper) in 1918 to chief engineer for the company's entire system in 1942. He served in that capacity until his retirement in 1953.

"More Oil For America"

The Interstate Oil Compact Commission has announced the publication of a pamphlet, "More Oil for America," a panel discussion presented by the chairman and members of the Commission of Denver, Colorado, June 18, 1955, under the title "Significance of Fluid Injection Operations in the United States." The compilation has been reprinted from the *Oil and Gas Compact Bulletin* (Vol. 14, June 1955, No. 1) and is available from the Interstate Oil Compact Commission, P.O. Box 3127, Oklahoma City 5, Okla.

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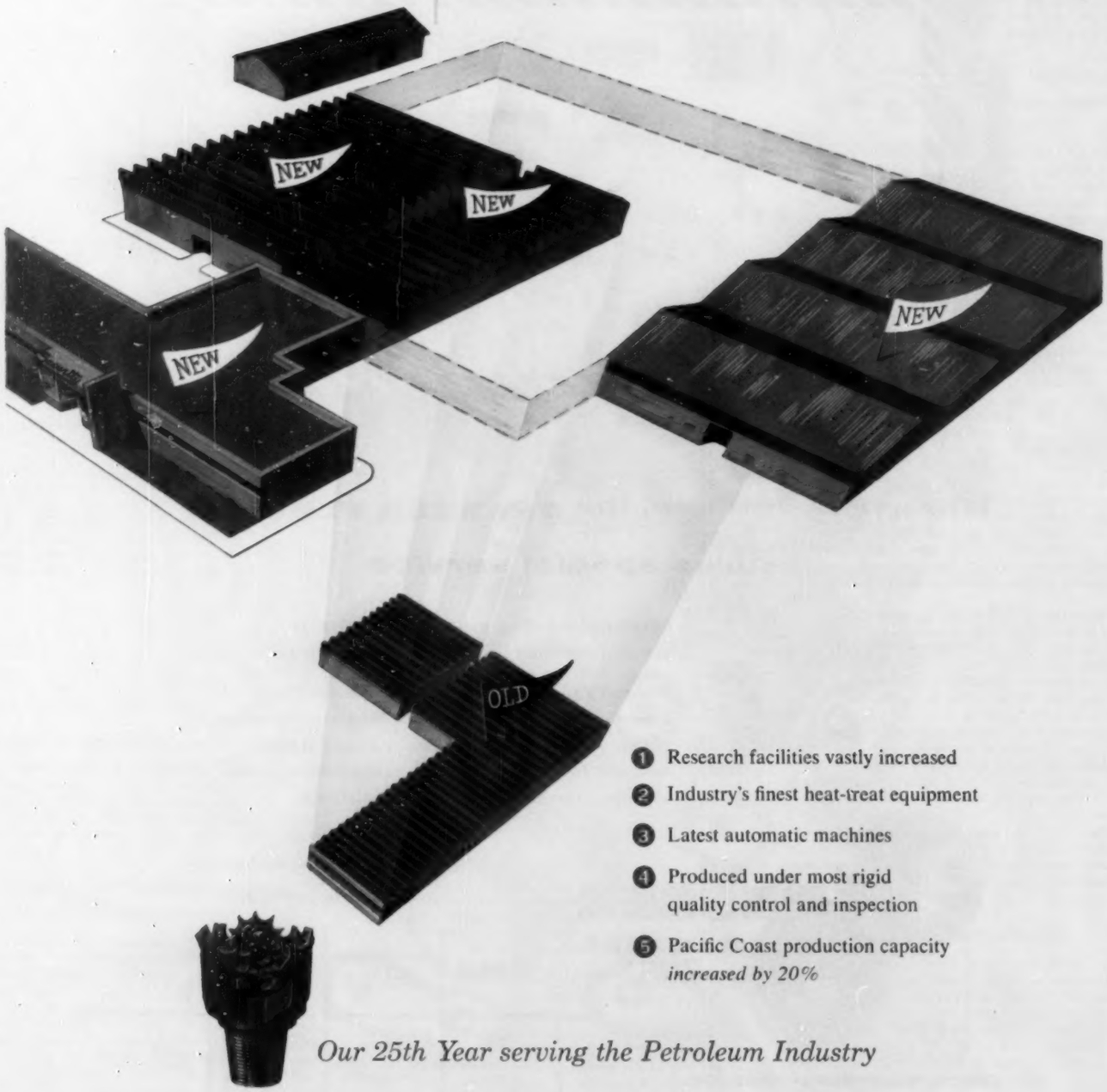

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World Production and Demand

(Continued from page 40)

No other countries in South America reported important changes in crude production. On a percentage basis Bolivia, Brazil and Chile were able to show substantial growth.

In North America the United States increased its output 406,000 b/d to 6,752,000 b/d, a rise of 6.4 percent. Until the hurricanes created havoc in the Tampico region in September, Mexico was enjoying an increase of about 10 percent in crude output. Average production was on the order of 250,000 b/d. The September storms caused output to fall to 188,000 b/d in that month and all of the damage has not yet been repaired.

Canada had another boom year in crude production and in demand for products. Production rose to about 347,500 b/d, an increase of 32 percent. The normal seasonal decline in the autumn was not as important this year because of the increase in exports of crude to new refineries in Washington state.

An accompanying tabulation gives domestic demand in 73 countries for major products in 1954. Figures are those compiled by the United States Bureau of Mines. They are the latest official figures available at this time.

The year 1954 was, of course, a far less satisfactory year than the one just closed. In the United States the lull in business created a small loss in consumption of major products. On the basis of total demand for all products there was a very small increase.

Outside the United States the Bureau of Mines report reveals an increase of 12.7 percent in demand for the five major products shown. The increase in total world demand was 4.4 percent. This was very close to the 1954 increase in crude production.

Demand figures in the Bureau report are estimates. They are based on refinery production plus imports less exports with adjustments to allow for inventory changes where these figures are known.

In the 73 countries listed, which exclude the U.S.S.R. and its satellites in eastern Europe, the production of major products totaled 4,283 million barrels and consumption 4,024 million barrels. Indicated inventory accumulation was 259 million barrels. Crude runs to stills were 4,962 million barrels, an increase of five percent over 1953.

Western Europe reported the greatest rate of increase in 1954 demand, the total for the year being 17 percent higher. Italy had an astonishing rise of 35 percent or 19.5 million barrels.

Southeast Asian demand was 15.3 percent higher than in 1953. Japan still was booming with an increase in consumption of 23 percent to 61,890,000 barrels.

Eight countries in the Middle East reported an increase of 7 percent.

Australia was the leading gainer in Oceania with a rise in demand of 13 percent to 46.1 million barrels. The region reported an increase of 9.5 percent.

South American consumption rose 20 million barrels in 1954 to 205.8 million barrels, an increase of 10.9 percent. Brazil reported a growth of 16 percent and Venezuela 10 percent.

Having set new records in all areas of activity last year the oil industry is looking forward to another year of prosperity in 1956. The ability to produce adequate supplies of oil to meet large new demands is unquestioned, but the industry must continue to reinvest vast sums in the search for new oil to maintain reserves and to keep transportation and manufacturing facilities expanding at a rate equal to the expansion of markets.

New Butte Pipe Line

Crude oil from the oil fields of eastern Montana is now flowing toward refineries through the newly completed 452-mile Butte Pipe Line. The first crude line in the area, the Butte is now receiving or will shortly receive production from the Poplar, Richney, Glendive, Gas City, Pine, Cabin Creek, Pennel, and Little Beaver fields.

Originating at Poplar, Mont., the line is owned jointly by Shell Oil Co., Murphy Corp., Placid Oil Co., and Northwestern Improvement Co., a subsidiary of Northern Pacific Railroad. The line was constructed and will be operated by the Shell Pipe Line Corp.

Oil Company Staff Changes

PAUL C. BERNER has been promoted to the position of district geologist in Lion Oil Co.'s Wichita district production and exploration office. Mr. Berner replaces C. Elton Gore who was recently promoted to regional geologist in the central region.

WADE E. THOMAS, Midland, Texas, division land superintendent for Continental Oil Co.'s southwestern region exploration department, has been promoted to the newly created position of assistant land superintendent of Conoco's southwestern region, with headquarters at Fort Worth. R. B. Smith, formerly assistant division land superintendent, succeeds Mr. Thomas. E. E. Fickinger, geophysical supervisor in the same department of Conoco, has been promoted to Midland division geophysicist, succeeding J. E. Finley, recently promoted to the newly created position of Midland division exploration manager.

ALBERT GREGERSEN has been appointed staff representative for the eastern hemisphere production department of Gulf Oil Corp. In his new capacity, Mr. Gregersen will serve as the Pittsburgh general office representative for the vice president of the eastern hemisphere production department, C. W. Hamilton, who is stationed in London, England.

M. V. COUSINS and **C. C. BARNETT** were elected vice presidents of United Gas Corp.'s transmission subsidiary, United Gas Pipe Line Co., at a meeting of its board of directors in November. Mr. Cousins has been a member of the board since March of this year. Mr. Barnett was elected to the board at the November meeting. D. D. Dillingham was appointed assistant to Ed Parkes, recently elected vice president and general manager of United Gas Corp. and its wholly owned subsidiaries. V. S. Brennan was named personnel director of the companies.

C. E. DAVIS, Shell Oil Co. vice president in charge of refining, retired at the end of last year after 38 years with the firm. He will become a petroleum consultant and serve part time as general secretary of the Fifth World Petroleum Congress, which will convene in the U.S. in 1959.

Thomas M. Dailey, Jr.

THOMAS M. DAILEY, JR. has joined Tide Water Associated Oil Co. as manager of the economics department. For the past nine years, Mr. Dailey has been petroleum economist for Humble Oil and Refining Co., Houston. From 1936 to 1946 he was associated with Woodley Petroleum Co., also in Houston.

During World War II he served in Washington, first with the Petroleum Administration for War and later with the Army-Navy Petroleum Board's planning division.

EUGENE E. DAWSON, former head of the drilling department of International Petroleum Co. Ltd. at Talara, has been promoted to services superintendent at the same location. He joined International at Talara in 1952 as assistant drilling superintendent, and became head of the drilling department later the same year. Mr. Dawson is succeeded by G. V. Young assistant head of the drilling department since 1952. H. S. Denney, Jr. has been transferred from the drilling section of the production engineering department to replace Mr. Young.

G. M. STEDWILL, chief chemist at Talara for International Petroleum Co. Ltd. has been promoted to head of the refinery department. After short service with Imperial Oil Ltd. in Canada, he joined Tropical Oil Co. in 1938 as a junior chemist at El Centro. The following year he transferred to Barranca as assistant chemist and became chief chemist in 1945. He transferred to International early in 1947 at Talara and became process control supervisor there in 1951. He was appointed chief chemist in September, 1952.

W. A. REAMAN is being transferred from head of the refinery department of Talara of International Petroleum Co. Ltd., to become assistant manufacturing advisor at Coral Gables, Fla. In September of 1937 he joined Tropical Oil Co. (a subsidiary of International) at Barranca as a school teacher. Two years later he transferred to the refinery laboratory from where he progressed through a series of assignments to become process control supervisor. In 1948 he joined International at Talara as chief process supervisor, and has been head of refinery department there since 1952. Upon completion of this vacation in the north, Mr. Reaman is expected to report to Coral Gables in November.

CARL W. REHFUSS has been appointed general manager of Standard Oil Company California's Richmond refinery, largest in the west and one of the largest in the country. He succeeds R. K. Rowell, who has been general manager since 1945 and who leaves his post after 38 years of service with the company. Mr. Rehfuss, previously assistant general manager of the refinery, has been with Standard since 1924. He has been on the management staff at Richmond since 1940 and has also had experience at the company's El Segundo plant.

ARTHUR W. BROWN has been appointed manager of the insurance and social security department of Standard Oil Co. (N.J.) succeeding J. W. Myers, retired. Mr. Brown joined Jersey Standard in 1946 as a specialist in the development of employee benefit plans. He later became employee relations manager at Esso Standard's Bayway refinery before being appointed assistant manager of the insurance and social security department under Mr. Myers.

DAVID L. YABROFF has been named manager of the marketing development department of Shell Chemical Corp. in New York. Mr. Yabroff joined Shell Development Co. in 1934 as a research chemist at the Emeryville Research Center in California and in 1948 became an associate director in the research division. Two years later he was named associate director of the development division and was named manager of manufacturing research for Shell Oil Co. in New York in 1951.

Succeeding Mr. Yabroff as director of the agricultural research division of Shell Development at Denver will be S. H. McAllister, an associate director in the research division at Emeryville since 1942.

RUPERT B. THOMAS, divisional attorney of Tide Water Associated Oil Co.'s eastern division, has retired after completing 35 years of service with the firm. Mr. Thomas joined the company as an attorney in 1920. In 1927, he advanced to assistant counsel, and in 1936 was named to his last post.

William R. Seuren

WILLIAM R. SEUREN was named vice-president of sales of The Frontier Refining Co. on November 1 at the quarterly meeting of the board of directors. Mr. Seuren joined Frontier as sales coordinator January 7, 1955. Prior to coming to Frontier, he spent five years with Deep Rock Oil Corp. as assistant industrial sales manager, lube oil supervisor, and assistant to vice-president of manufacturing.

ERNEST V. POTTER has been named manager of the land department for Sunray Mid-Continent Oil Co. Mr. Potter previously was division landman. His offices will continue to be located in the Sunray building in Tulsa.

FORREST G. HEATH has been appointed manager of asphalt sales for The American Oil Co. He succeeds James N. Byrd, who has retired on annuity.

FRANK D. LORTSCHER has been elected a director of the Signal Oil and Gas Co. Mr. Lortscher is presently manager of purchases and stores. He has been with Signal 28 years in various capacities.

HAROLD F. PARSONS has been appointed New York representative of Crown Central Petroleum Corporation with office at 630 Fifth Avenue, New York, N.Y. He will be responsible for wholesale sales of the Company's products. Mr. Parsons retired as assistant vice president of Tide Water Associated Oil Co. in 1954 after more than 36 years of service.

Cecil Morgan

William R. Carlisle

CECIL MORGAN, government relations counselor for Standard Oil Co. (N.J.) since October 1952, and a former vice president and director of Esso Standard Oil Co., has been appointed executive assistant to Jersey Standard's chairman of the board, Eugene Holman. Mr. Morgan succeeds George Koegler who became Jersey's deputy general counsel in November.

Before joining Esso Standard's legal staff, Mr. Morgan served as a U.S. Commissioner in the Western District of Louisiana, as representative and senator in the Louisiana legislature, and as a judge in that state's first judicial district. He became a vice president of Esso Standard at Baton Rouge in 1949 and transferred to New York in January 1952 after his election to the Esso Standard's board of directors.

William R. Carlisle, succeeds Mr. Morgan as government relations counselor. Mr. Carlisle was associate general counsel before his appointment.

IN CANADA: DIKKERS, LTD., SCARBOROUGH, ONTARIO.

JOHN O. BOWER has been appointed vice president and manager of Colombian Petroleum Co. and South American Gulf Oil Co. with headquarters in Cucuta, Colombia. He succeeds C. O. Isakson who has been appointed management consultant pending retirement in April, 1956. The companies are jointly owned by Socony Mobil Oil Co., Inc., and The Texas Co.

Mr. Bower joined the Texas Co. in Colombia in 1927 as a geologist. Following service in Colombia, Venezuela, the Argentine and Trinidad, he became manager of The Texas Petroleum Co. at Bogota, Colombia, in 1940, a post which he held until his present appointment.

Mr. Isakson spent more than 30 years with the oil industry in Mexico, Panama, Peru, Venezuela, the Argentine and Colombia, of which about 20 years were spent with affiliates of Socony Mobil and Texas. He became vice president and general manager of the Colombia companies in 1942.

RUSSELL W. BOWERS has been appointed treasurer of Sun Pipe Line Co., where he also is manager of operations and a director. William S. Woods, Jr., an administrative assistant in the treasury department of Sun Oil Co., parent of the subsidiary, becomes assistant treasurer of the Pipe Line to succeed Mr. Bowers. Mr. Woods retains his former duties in Sun Oil Co. Both appointments follow the retirement of Arthur H. Russell, former treasurer.

G. E. WAGONER has been elected a director of International Petroleum Co., Ltd. Mr. Wagoner was graduated from the Colorado School of Mines in geological engineering in 1928. He started working for Humble Oil and Refining Co. Later, he joined the Standard Oil Co. of Louisiana and, still later, the Carter Oil Co. In December 1954, Mr. Wagoner resigned his position as Carter's Western Division manager at Denver to accept the position of exploration advisor with International Petroleum Co., Ltd.

Nicholas J. Campbell, Jr.

NICHOLAS J. CAMPBELL, JR. has been elected a vice president of Creole Petroleum Corp. Mr. Campbell is presently manager of the law department with headquarters in Caracas, Venezuela. He will assume his new title and duties early this year, when he will move to the New York office.

HORACE H. CHANDLER has been appointed superintendent of The Texas Company's Eagle Point works at Westville, N. J., succeeding R. H. Aitken who has been appointed manager of the refining division of Texaco's foreign operations department (Western Hemisphere and West Africa). Mr. Chandler joined Texaco in 1932 as a student trainee at the Port Arthur works where he remained until 1954 when he was promoted to assistant superintendent of the Eagle Point works. W. R. Sorenson succeeds Mr. Chandler as assistant superintendent.

WATSON CALDWELL, district geologists for Sunray Mid-Continent Oil Co. at Lake Charles, La., has been promoted to Gulf Coast division geologist with headquarters in Tulsa. He replaces Joe Peerson who has resigned.

F. L. JOHNSON has been appointed director of production research and development for Sun Oil Co. at Dallas, Texas. The appointment marks a reorganization of the research program of Sun's production department, and coincides with the completion of a modern laboratory at Richardson on the outskirts of Dallas. The lab will be opened officially later this fall.

Preston E. Chaney, formerly manager of the Beaumont production laboratory, has been appointed assistant director. He is succeeded there by H. W. Perkins.

Dr. R. J. Cordell, formerly of the Abilene laboratory, has been appointed acting manager of geological research and has moved his headquarters to the new Richardson laboratory. Other key men moving in are: Morris Bock, I. B. Hamilton, B. M. Gottlieb, Fred M. Mayes and J. W. Jones also has moved from Newton Square as a research engineer.

CAPT. GEORGE LARIMER has been made port captain at Sun Oil Company's tankship fleet headquarters in Marcus Hook, Pa., succeeding Captain Robert J. Ball, retired.

C. ELTON GORE has been promoted to regional geologist in the central region of Lion Oil Company's production and exploration division. He was formerly a district geologist of the Wichita, Kansas, district.

ASA V. CALL, Los Angeles life insurance executive and civic leader, has been elected to the board of directors of Standard Oil Co. of California, according to an announcement made by Chairman R. G. Follis following the November meeting of the board in San Francisco.

Mr. Call has been president and a director of Pacific Mutual Life Insurance Co. since 1942, during which period Pacific Mutual has experienced its period of greatest growth. Graduated from the University of Southern California and the U.S.C. Law School, he was a leading corporation counsel for many years before joining Pacific Mutual. He became vice president and counsel of that company in 1933 and executive vice president and general counsel in 1935.

Above, Ferry Balfour, British Columbia, powered and steered with two Harbormasters.

Catherine Graham, showing Harbormaster elevated for inspection.

Harbormasters are ready answer to many tough marine power and steering problems

these heavy duty outboard propulsion and steering units are a complete package, compact and easily installed

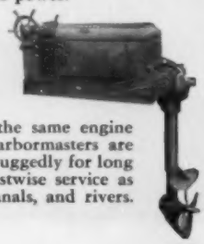
Quickly and easily installed

Harbormasters are assembled and tested at the plant and are ready for immediate use on barges, ferries, fishing craft, tows, lighters, dredges, etc. In many cases Harbormasters can be installed and ready to go merely by mounting with four hold-down bolts. Even on largest units, only fuel tanks and controls are installed separately.

Outstanding maneuverability

You have 360-degree maneuverability and can dock or maneuver in crowded quarters, stay headed into the current on sharp river bends or in tide rips, run into locks without losing time, shunt or pick up barges with precision, or reverse with full power.

Rugged-Powerful



With these outboards you get more actual delivered thrust per H.P. than with the same engine with an inboard system. Harbormasters are heavy duty equipment, built ruggedly for long life. They are ideal for coastwise service as well as in harbors, lakes, canals, and rivers.

Easy service and maintenance

Special 180° elevating mechanism allows one-man operator to raise entire submerged assembly to any degree he desires. No dry docking or diving is necessary for repairs.

Shallow water protection

In shallow water, shear pin lets tail section ride up and over submerged obstacles. Shear pin is easily replaced while underway. If desired, the unit can be operated with tail section in partially elevated position to reduce draft.

Models and installations to meet your needs

Four series are available with models ranging from 40 to 400 h.p. All are designed for installation on existing powered or unpowered craft and on new craft of all types. In many cases the installation can be made with no alterations to the hull whatever.

Harbormaster Outboard Propulsion and Steering is the money-saving way to solve many tough marine power and steering problems. Recommendations are available without charge, based on hundreds of installations. Send for New Catalog giving complete information and showing many Harbormasters in action.

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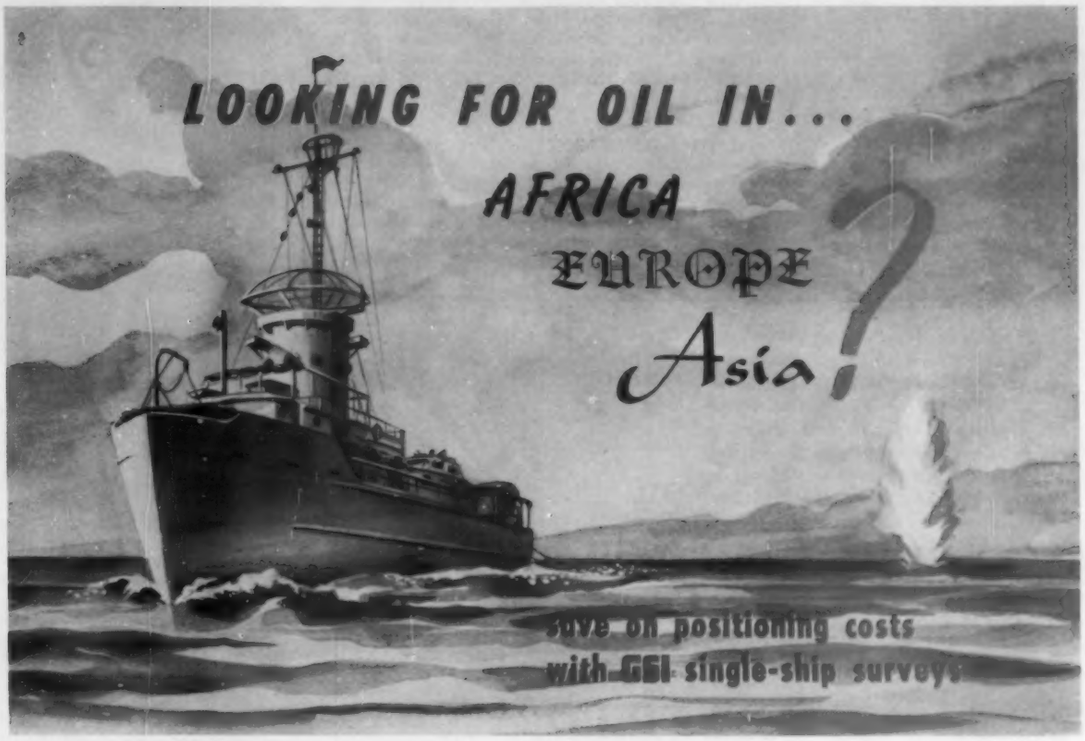

GSI's M/V SONIC is now conducting marine seismic surveys in the Eastern Hemisphere. Minimum positioning costs are made possible by its location in this region. **Stretch your exploration budget with this additional benefit.**

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The 405-ton SONIC is an ocean-going vessel equipped for fast single-ship seismic operation. It stays on the job in weather which sends smaller craft hurrying to port. SONIC equipment includes the new 7000-series seismic amplifiers and magneDISC magnetic recording facilities for data storage. A pressure-sensitive seismometer streamer with 40 detectors per trace (other streamer arrays available) gives the advantages of multiple seismometers to marine recording.

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A World of Experience in Finding a World of Oil

J. W. S. STRAUGHAN has been appointed chief engineer superintendent of The British Petroleum Company's British Tanker Co. in succession to the late A. Aitken.

After sea service as a junior engineer, Mr. Straughan joined the British Tanker Co. as a third engineer in 1917, and was first appointed chief engineer in 1919. He was transferred to shore duties in 1936 and appointed superintendent engineer in 1937.

W. A. LOCKWOOD has been appointed senior economics analyst for International Petroleum Co., at Coral Gables, Fla. Prior to this assignment, he was an economic analyst in the manufacturing department of Esso Standard Oil Co. in New York.

EARL W. RUSSELL has become executive assistant secretary of Standard Oil Co. (Ind.) Formerly assistant secretary of the company and administrative assistant in the office of the president, he has been transferred to the secretary's department.

RICHARD ROLLINS, secretary of The Atlantic Refining Co., Philadelphia, Pa., was elected 1956 National Chairman of the Oil Industry Information Committee of the American Petroleum Institute at the OIIC's recent quarterly meeting. Mr. Rollins who handles the company's public relations will succeed W. R. Huber, public relations director of Gulf Oil Corp. He will take office early in December.

Vice Chairmen elected at the Chicago meeting were Jerry Luboviski, Union Oil Co. of Calif.; M. S. Hauser, Ohio Oil Co.; G. A. Mabry, Humble Oil & Refining Co.; Arthur J. De Blois, De Blois Oil Co.; and Kenneth W. Rugh, Phillips Petroleum Co.

G. OTIS DANIELSON has been appointed by Kerr-McGee Oil Industries, Inc. as manager of drilling operations in the company's Gulf Coast region, effective December 1. Until that date, Mr. Danielson was manager of drilling operations in Kermac's Mid-Continent region, which includes the Oklahoma-Texas and Rocky Mountain divisions.

CURTIS M. KLAERNER, manager of the Buffalo refinery of Socony Mobil Oil Co., Inc., has been named assistant general manager of operations for the manufacturing department at New York headquarters. He has been succeeded by T. C. Lockhart, formerly company manager of the light oil operations division of the New York manufacturing department.

Mr. Klaerner joined Magnolia Petroleum Co. in 1942 and was named manager of the Buffalo refinery in 1954. Mr. Lockhart joined Socony Mobil in 1936 as a junior engineer at the Paulsboro, N.J., refinery. He has been manager of the light oil operations division since 1953.

DON W. WOODS, director and general counsel of General Petroleum Corp., brought to a close an active career of nearly 40 years in the West Coast petroleum industry with notice of his official retirement from General Petroleum, effective April 1, 1956.

Mr. Woods, who was named a director and general counsel for General Petroleum in 1946, joined the company in 1916 to investigate an oil land controversy. He became secretary of the corporation in 1932. He has taken an active part in industry affairs, serving on the Legal Committee of the Western Oil and Gas Association and the Kettleman North Dome Association. He also has served on the tax committee of the Southern California Council of the State Chamber of Commerce, as well as on legislative and tax sections of Los Angeles Town Hall.

ARTHUR H. ELLIOTT has been named executive vice president and general manager of Iricon Agency Ltd. according to an announcement of Richard S. Stewart, president of Iricon. Iricon Agency Ltd. is acting as agent for the nine independent American oil companies in certain matters relating to the Iranian oil consortium.

Mr. Elliott will be a director of Iranian Oil Participants Ltd. and of Iranian Oil Services Ltd. As general manager of Iricon Agency Ltd., he will be in charge of the company's London office and will handle all of its activities. He will have no responsibility in connection with marketing and transportation activities, all of which are handled individually by the nine companies.

The companies which hold an aggregate interest of 5 percent in the consortium are American Independent Oil Co., The Atlantic Refining Co., Hancock Oil Co., Pacific Western Oil Corp., Richfield Oil Corp., San Jacinto Petroleum Corp., Signal Oil and Gas Co., The Standard Oil Co. (Ohio) and Tide Water Associated Oil Co.

J. HARRY WOOD, JR. has been selected to manage The Atlantic Refining Company's intensified program of acquiring additional oil producing properties it was announced by L. A. Sunkel, vice president and general manager of the company's crude oil production department. Mr. Wood will retain his present position as vice president and general manager of Atlantic's crude pipe line subsidiary in Texas.

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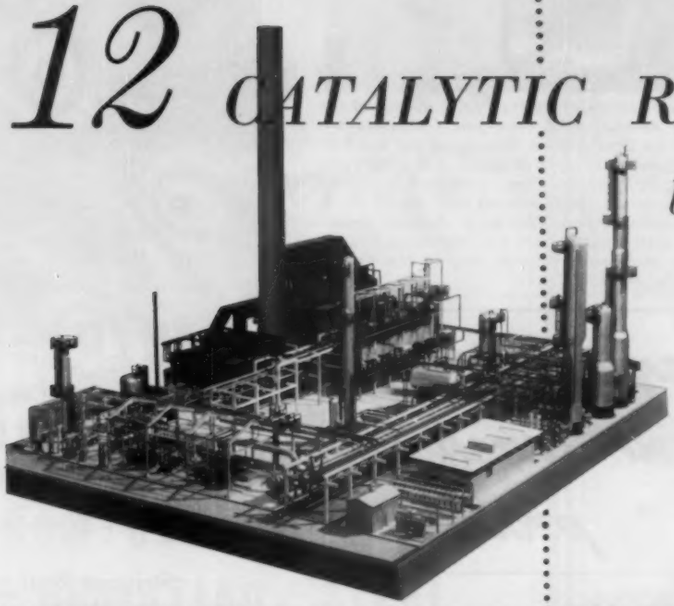
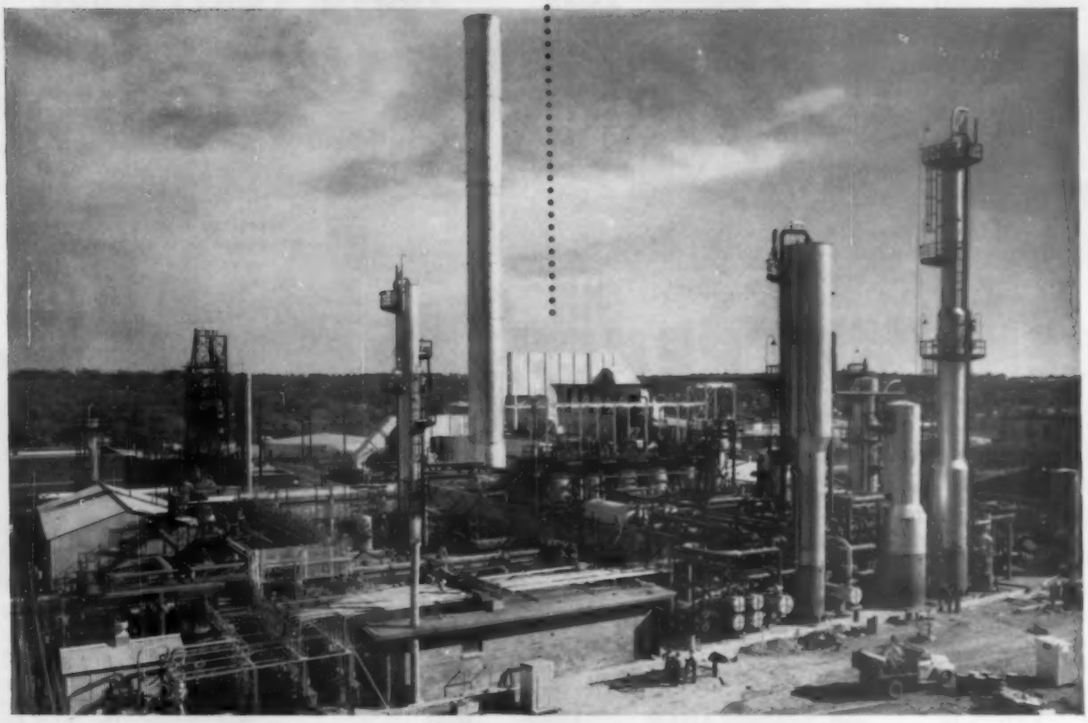
12 CATALYTIC REFORMERS

by **PARSONS**



Contracts for twelve catalytic reformers have been awarded to Parsons. These plants range in capacity from 600 to 17,000 barrels per day and include regenerative and non-regenerative units using four different platinum-type catalysts. Process design, engineering, procurement, and construction of these catalytic reformers are by Parsons.



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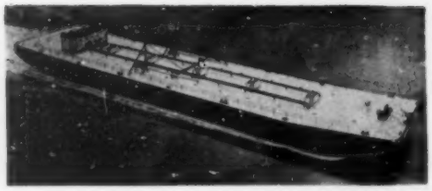
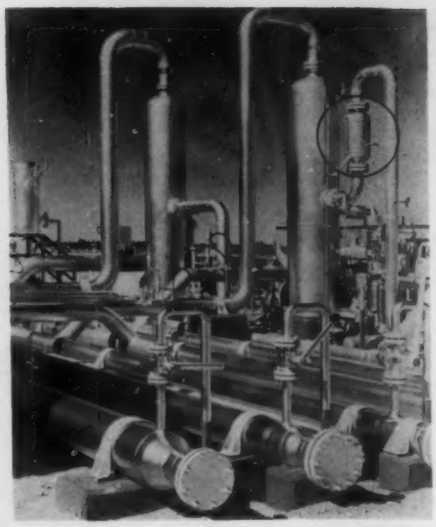


World's Largest Oil Tow Barge

A coastwise oil-carrying tow barge, the largest in the world, has been launched at Alameda, California, by Pacific Coast Engineering Co. for Tide Water Associated Oil Co. The vessel is 290 feet long, just ten feet shorter than a football field. Christened the Amorco, it is 50 feet wide, has a draft of 18 feet, 7 inches, and a flush deck. Its 14 separate cargo tanks are able to carry 48,100 barrels of oil. Of all welded steel construction and a capacity of 270,000 cubic feet, it is to be classed A-1 by the American Bureau of Shipping.

Newly elected officers of the Pacific Section of the American Association of Petroleum Geologists, installed at the 32nd Annual Meeting of the A.A.P.G. Reading from left to right: Mason L. Hill, chief geologist with Richfield Oil Corp., president; Loyde H. Metzner, assistant chief geologist with Signal Oil & Gas Co., vice president; Thomas A. Baldwin, senior geologist with Monterey Oil Co., secretary; Everett W. Pease, chief geologist with Sunray Mid-Continent Oil Co., treasurer.



Compact Low-Cost Purifier

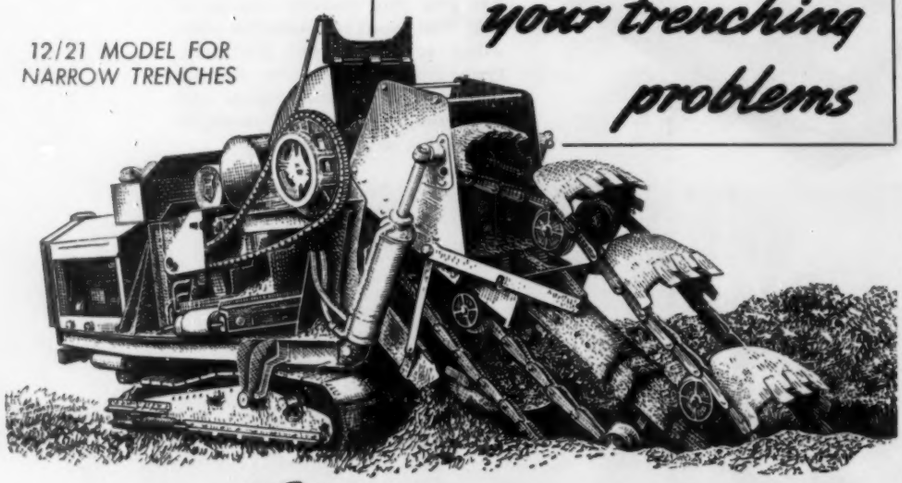
A new purifier, Hi-eF Type L, developed by the V. D. Anderson Co. for use in gas scrubbing, is said to recover virtually 100 per cent of the recoverable liquid present in natural gasoline, at a saving in capital investment of up to 500 per cent over conventional tank-type gas scrubbers.

Stripper Well Survey

The National Stripper Well Survey for January 1, 1955, reveals that the total number of stripper wells have increased to 340,376, or approximately 68 per cent of the total of the U. S. During 1954, these wells produced 432,495,896 barrels, or an average of 3.48 b/d, as compared to the national average of all wells for 12.49. The total reserves remaining in the stripper well fields of the U. S. is estimated at 7,714,410,000 barrels, of which approximately 4,000,000,000 barrels are estimated can be recovered only by use of secondary methods. This secondary recovery reserve represents approximately 35 per cent of the total estimated secondary recovery reserves in the U. S. This study is available from the Interstate Oil Compact Commission, P.O. Box 3127, Oklahoma City 5, Okla.

The answer to all your trenching problems

12/21 MODEL FOR NARROW TRENCHES



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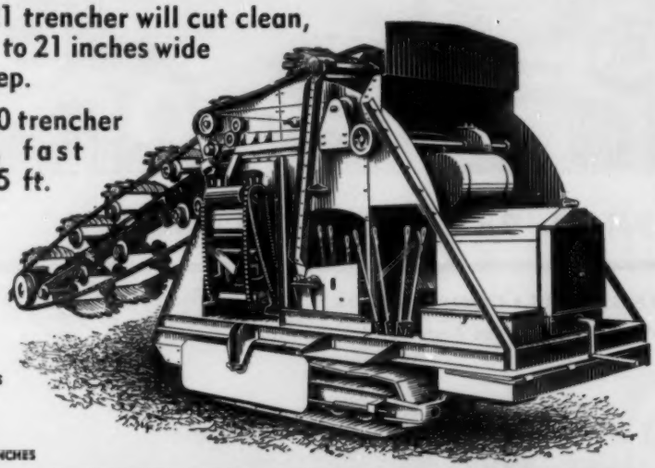

Illustrated catalogues sent on request.

16/60 MODEL FOR WIDER TRENCHES

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George R. Ferguson *William E. Murray*

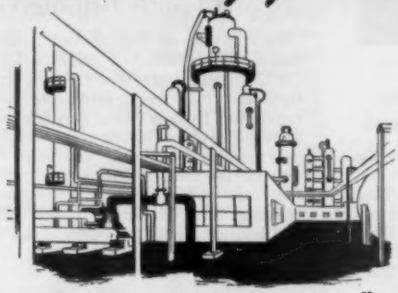
GEORGE R. FERGUSON has been appointed general manager of the newly formed North European division of California Texas Oil Co., Ltd. The division consists of the United Kingdom and Ireland, Algeria, the Azores, Iceland, Tunisia, Scandinavia, the Benelux countries, Finland, France, Germany, and Switzerland. Mr. Ferguson was formerly general manager of the Caltex Far East division and has been with Caltex since it was formed in 1936. He will be replaced in his former position by William E. Murray, who has many years of experience with Caltex in the Orient.

William Schwarz, formerly Caltex shareholders' representative in Italy, has been appointed general manager of the new South European division, consisting of Austria, Cyprus, Gibraltar, Greece, Italy, Portugal, Spain, Tangiers, Turkey, and Yugoslavia. S. H. Kuhn, who has been with Caltex and predecessor companies for 35 years, has been named general manager of the Australasian division. Thomas W. Donlon has been appointed general manager of the producing division.

"TROPIC"

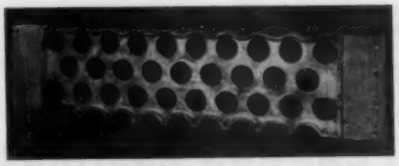
HEAT RESISTING

Tube Supports

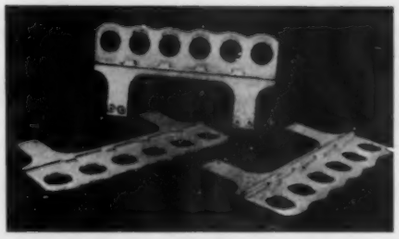


MADE FROM OSBORN "TROPIC" HEAT-RESISTING STEEL

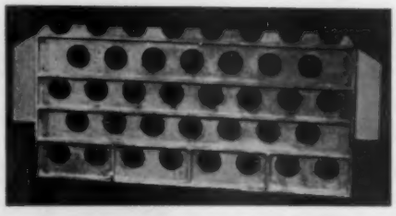
"TROPIC" Fireproof Steels have been developed primarily to provide an alloy with exceptional Heat-Resisting qualities eminently suitable for furnace parts.



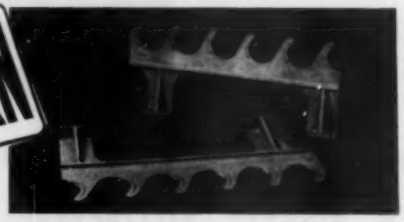
"TROPIC" Tube Supports are cast from these Chrome Nickel Alloys, to meet A.S.T.M., B.S. and Oil Company Specifications.
They are guaranteed accurate to drawing dimensions and are imparted with a superfine finish. Long Service at High Temperatures is assured.



"TROPIC" Steels are available in Sheet, Plate and Bar Form, also Forgings for making up into ancillary equipment.
Samuel Osborn & Co., Limited are major producers of Heat-Resisting Steel Furnace Castings, for refineries throughout the world.



OSBORN



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FOR DRIVING PUMPS, ETC.

Wide range—All types.
Over 40 years' experience.
Hundreds in hand — thousands in service.

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The widest range in the British Empire — made to suit your requirements.
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Turbine driven up to 11,000 KW.
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Scores in hand, hundreds in service.

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Ammonia, CO_2, Freon, Methyl Chloride, SO_2. Wide range — single and double acting — one or more stages. **Made to measure for special duties.**

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Many in hand and hundreds in service.

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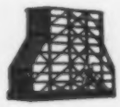

All types.
Nearly 50 years' experience.

also Manufacturers of all kinds of

PLANT TO CUSTOMERS' OWN DESIGNS

WHY NOT SEND YOUR PROBLEMS TO US?

We shall be pleased to investigate them confidentially without commitment

BROTHERHOOD
PETERBOROUGH ENGLAND
COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

Corrosion-Proofed Tank-Trailer

A 4,050 gallon highway tank-trailer—protected against corrosion for the first time with a new fluorocarbon plastic coating—began hauling sulfonic acid recently. The new high-temperature-resistant, chemically inert coating is a KEL-F plastic dispersion, developed by The M. W. Kellogg Co. It was applied to the inside of the 33-foot Trailmobile tank-trailer at Kellogg's Jersey City plant in one of the largest furnaces ever built for experimental coating use.

According to Kellogg, the advent of this coating in tank-trailer service marks new economies for those who ship chemicals as well as those who carry them, and, as such, should stimulate the growth of rapid delivery of corrosive chemicals by tank truck movements. Figures recently released by National Tank Truck Carriers indicate that approximately 5,000 for-hire tank trailers were used for over-the-road chemicals hauls in 1954—a movement of chemicals by truck that was virtually non-existent until the late 1940's.

Elected Divisional V.P.

Fred S. Gombert has been elected divisional vice president of the Ingersoll Conditioned Air Division of Borg-Warner Corp. Mr. Gombert is manager of the Conditioned Air division,

John C. McCauley

Hammond Iron Works Appointment

John C. McCauley has been appointed to the sales engineering staff of Hammond Iron Works. Mr. McCauley will make his headquarters in New York City. His services will be available to the petrochemical and processing industries, to which Hammond Iron Works is a major supplier of tankage, processing vessels, and general steel plate construction.

Kinsman Resigns

J. Warren Kinsman has resigned after a career of more than 40 years with the Du Pont Company. This action, accepted by the board at its regular monthly meeting in November, carried with it his retirement as a vice-president and member of the executive committee. Under company pension provisions, any Du Pont employee can retire at age 60 provided he has 30 or more years of service.

Gigantic Drilling Vessel

At 4:30 p.m. on November 17, 1955, The Avondale Marine Ways launched the S-55 for The California Co. Designed by the New Orleans firm of Friede and Goldman, Inc., naval architects and marine engineers, the S-55 is being constructed to operate in 75 feet of water offshore and, as launched, is as high as a ten-story building. The beam when completed will be 150 feet, which is too great to allow construction and launching from conventional shipbuilding ways. Accordingly, the S-55 was designed and launched with the beam of the main hull member at 90 feet.

Ethyl Appointment

William C. Ludt has been appointed assistant manager of the gasoline testing division of Ethyl Corp., with headquarters at Yonkers, N.Y. For the past seven years, Mr. Ludt has been manager of the Ethyl gasoline testing laboratory at North Kansas City, Mo.

Edward J. Otto has been promoted from deputy manager of the North Kansas City laboratory to manager.

What next . . . in NON-FERROUS castings?

Casting this water turbine runner in a single piece from aluminum-bronze was a considerable achievement.

Birkett, Billington & Newton were able to tackle the job because they have specialized in the development of this metal, and their unrivalled experience and facilities enable them to carry out such problematic non-ferrous castings.

Aluminium-bronze has a high yield point and a low weight/strength ratio, and is very resistant to shock, erosion, corrosion and abrasion.

The runner and other castings have been made by Birkett, Billington and Newton for this 750 H.P. Pelton Wheel Generator supplied to the New Zealand Government by Gilbert Gilkes and Gordon Ltd., of Kendal.

Castings from a few ounces to 10 tons in phosphor-bronze, gun-metal, aluminium-bronze, manganese-bronze and light alloys. Precision-machined bushes and bearings. Specialists in high-tensile aluminium-bronze castings, centrifugal-cast wheel blanks, and chill-cast rods and tubes.

One of Britain's Largest NON-FERROUS FOUNDRIES

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Jack H. Walters

T. O. Carson

John B. Laramy

Alvin F. Welsh

Glen Horrie

Jim Edwards

Rockwell Names Sales Managers

Changes in key sales personnel at Rockwell Manufacturing Co.'s Meter and Valve Division: Jack H. Walters, gas products manager for the past year, has been named manager of gasoline and oil products; Robert B. Kitzmiller, San Francisco district sales manager since 1952, has been named gas products manager, T. O. Carson, assistant product manager, Nordstrom valves, has assumed the additional responsibility of manager of distributor sales; M. F. Groom, a sales engineer from the Houston, Texas, district, has been named assistant manager of distributor sales.

John Griswold Van Santvoord

John Griswold van Santvoord, manager of the marine sales division of the domestic sales department of The Texas Co., died Nov. 21, at his Larchmont, N. Y., home. Mr. Van Santvoord was born on February 24, 1895, in Troy, N. Y. He joined The Texaco Co. in 1919 as a clerk in the lubricating division of the sales department.

Appointed Worthington General Sales Mgr.

John B. Laramy has been appointed assistant general sales manager of Worthington Corp. Alvin F. Welsh was appointed manager of the marketing research department.

Deep-Drilling Record Set

A new world record in deep well drilling was established off a barge in the Mississippi Delta marshland 40 miles southeast of New Orleans in Lake Washington Field (Plaquemines Parish) six miles east of production.

The well is over 21,484 feet deep. The owners are Richardson & Bass, of Fort Worth, John W. Macom, of Houston, and the Freeport Sulphur Co. The test is the No. 1-L Louisiana Land and Exploration Co. It is in State Lease 2414, Plaquemines Parish. Richardson & Bass is the operator.

The new record well is located in an area just west of the Mississippi River in marshland accessible only by boat or plane.

McCullough Tool Personnel

McCullough Tool Co., Los Angeles, Calif., reports the following changes in staff positions: Jim Edwards has been promoted to sales manager of the Mountain Division and has established new division sales headquarters in Denver. Newton Ottinger, division logging engineer, will also work out of the new Denver office. Glen Horrie has been transferred to Bakersfield, Calif., as McCullough's San Joaquin Valley District sales manager.

Jack W. Holz has been appointed sales engineer at the company's Carmi, Ill., service branch location. A new service location has also been established at Salem, Ill.

Utah Strike Producing 2,500 B/D

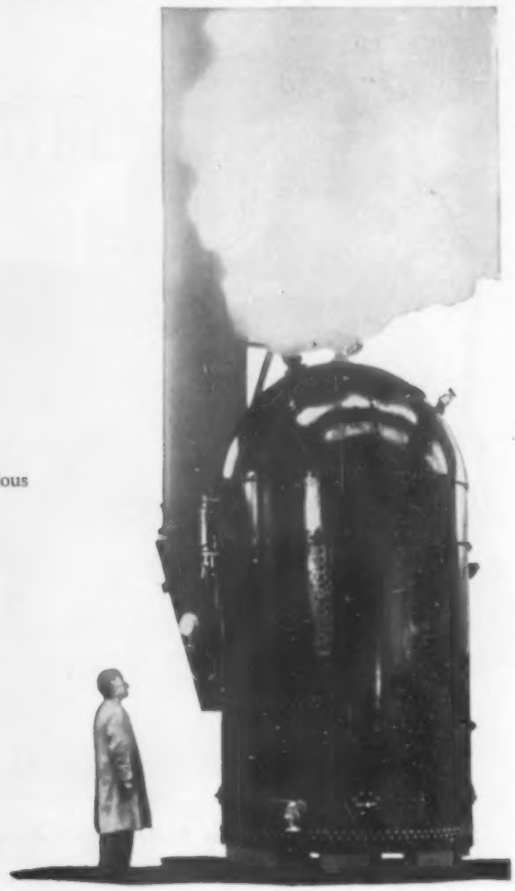
The New World Oil and Uranium—Max Pray Government #1 wildcat has been brought in eight miles away from the Rangely Field in the Uintah Basin of Utah, and is currently producing at the rate of 2,500 b/d. The strike was made at the Dakota sand and more oil is reported at the Weber sand at 1,400 feet. The well is producing five million cubic feet of gas per day.

COCHRAN BOILER CONSTRUCTION • No. 1

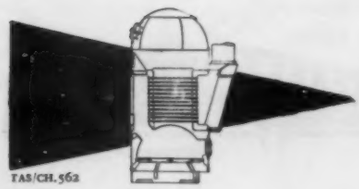
A series of descriptions to demonstrate Cochran craftsmanship.

Testing

The final stage in the manufacture of a COCHRAN boiler is the testing.
Each Cochran boiler is tested hydraulically and by steam irrespective of whether or not it has been built to the survey of an authority which requires to witness such tests.
On hydraulic test, a pressure of one-and-a-half times the working pressure, plus 50 psi, is used.
Before the subsequent steam test, the boiler is equipped with its mountings which are checked for correct operation when working pressure is reached. The safety valve is then set.
This double test, accompanied by a rigorous examination by the works inspectors, gives an overall check that the finished product is in accordance with the high standards maintained throughout the various constructional processes, nine of which are described in the present series of announcements.



COCHRAN



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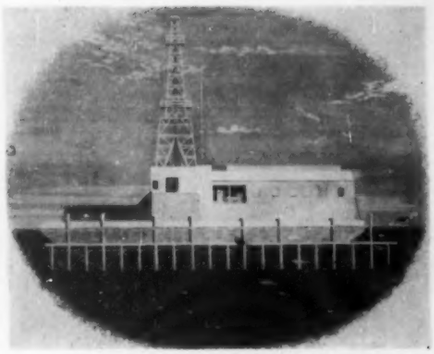


Offshore Drilling Technique

Engineers for Magnolia Petroleum Co., Dallas, Texas, have completed plans for a unique "bird-on-a-nest" method of offshore drilling. It will be put to use in early 1956 when the company will launch an attempt to locate oil in the Gulf of Mexico near the mouth of the Mississippi River. Plans call for erecting a piling structure whose top will be eight feet under water. A Magnolia-owned drilling barge, already equipped with full drilling equipment, will be floated into place above the structure and sunk by means of ballast. Extensions from the underwater piling will project above the surface, and the barge will be secured to them by means of cables during drilling operations.

Magnolia says its new technique will combine the major features of the other two methods: permanent platforms extending above water level or floating drilling rigs with built-in "legs." It will consist of a floating barge "nesting" on a permanent-type structure. Should oil be found, the underwater structure will be extended to 20 feet above water level to hold production equipment.

University of Akron Wins Research Contract

A contract for research on synthetic rubber manufacturing processes has been awarded by Shell Chemical Corp. to the government laboratories at the University of Akron. Results obtained at Akron will be coordinated with other rubber research projects now in progress at Shell's Torrance (Calif.) laboratory and at Shell Development Co. at Emeryville (Calif.). Shell Chemical now produces synthetic rubber at Torrance in combined butadiene-styrene-copolymer facilities recently acquired from the government.

Vitro To Process Uranium Ore

According to an announcement by J. Carlton Ward, Jr., president of Vitro Corp. of America, and Floyd B. Odlum, president of Atlas Corp., Vitro will process the uranium ore output of Hidden Splendor Mining Co., Atlas subsidiary, at the Salt Lake City mill of Vitro Uranium Co.

Hidden Splendor holdings are near the Muddy River in Emery County, Utah, and consist of the original extensive claims purchased from Vernon Pick more than a year ago. The amount of ore sent to Salt Lake City will be a minimum of 5,000 tons a month, with an option by Hidden Splendor to increase the amount to 9,000 tons.

Longest Undersea Pipeline

Oil and gas has started to flow through the world's longest undersea pipeline, a submerged 48-mile system off the shores of Louisiana and owned by Continental Oil Co., Magnolia Petroleum Co., and Newmont Oil Co.

The submarine line follows a 48-mile dogleg route from Bruns Terminal south of Franklin in St. Mary parish to Magnolia-Conoco-Newmont wells as far as 25 miles offshore. Cost of the line is estimated at $7 million and is officially known as "Eugene Island Fields Flowline System."

Robert L. Wood

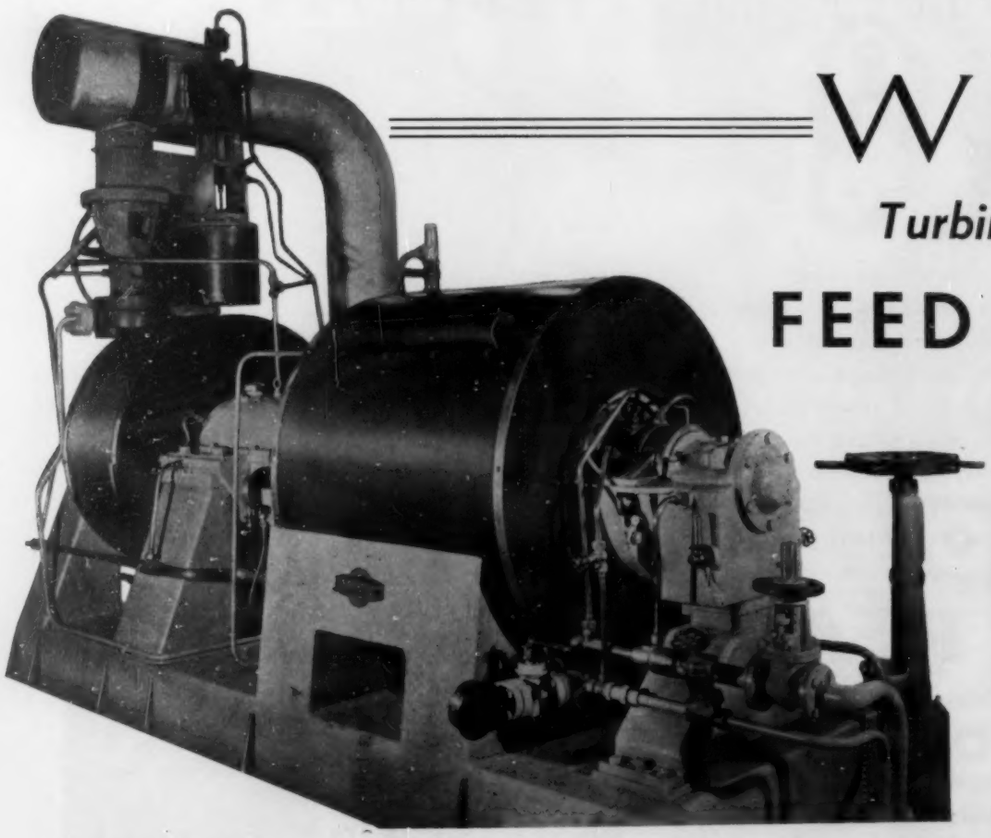
New I.P.A. President

Robert L. Wood assumed office on January 1 as president of the Independent Petroleum Association of America. He is a resident of Midland, Texas, where he owns and operates Basin Drilling Co. and is an independent oil producer.

Mr. Wood's election to the IPAA presidency concluded many years of active work in the Association. He has served IPAA as a director since 1945. In 1948-49 he was IPAA vice president for the Permian Basin; in 1949-52 he was a member of the executive committee. He has served on several important committees of the Association, including the import policy committee.

Executive Elected

E. C. McGraw, vice president in charge of operations at Transcontinental Gas Pipe Line Corp., was elected executive vice-president.



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FEED PUMPS

Made in single or multi-stage types for the highest pressures and temperatures. Barrel-casing or ring-section designs to meet required operating conditions. Pressure-operated automatic cut-in gear for stand-by duties, and relay-operated automatic by-pass valves available.

Write for Publication No. IL. 35
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The foremost name in Boiler Feed Pumps for more than sixty years

2-For-1 Stock Split Voted

Directors of Transcontinental Gas Pipe Line Corp. have voted to recommend a 2-for-1 split of the company's 3,530,000 outstanding shares of common stock. To provide sufficient stock to effect the split, stockholders will be asked to approve a recommended increase in the authorized common stock from five to ten million shares at a special meeting to be held in Houston, Texas, January 10. Subject to this approval, stockholders of record January 20, 1956, will be entitled to receive one additional share of common stock for each share owned of record on that date. The company has no intention of selling any additional stock at present.

Tom P. Walker, president of Transcontinental, said that beginning last November the company's earnings would be increased by the operation of new facilities completed and placed in service during November as scheduled. These facilities, costing approximately $77,000,000, will expand the allocated capacity of the system from 565 million cubic feet to 705 million cubic feet per day.

Operating revenues for the 12 months ended September 30, 1955, amounting to $89,918,170, were $9,528,031 more than revenues for the corresponding 12 months period a year earlier. Net income of $9,423,046 showed an increase of $1,039,316 and was equal to $2.18 per common share, compared with $1.97 for the preceding year.

Gulf Oil To Build In Philadelphia

The Gulf Oil Corp.'s Philadelphia sales division will occupy, in about 18 months, a new T-shaped, four-story office building to be erected on a five-acre tract at the intersection of City Line Avenue and the Schuylkill Expressway, opposite the Presidential Apartments. The Philadelphia division serves company operations in Pennsylvania, southern New Jersey, Delaware, Maryland, District of Columbia, Virginia, and West Virginia.

Steam-Pyrolysis Process

A unique steam-pyrolysis process which allows the refiner to dispose of marginal products by economically converting natural gasoline, residuals, or other low value materials to ethylene and olefins, is the subject of a new 8-page booklet published by The M. W. Kellogg Co. As shown in the booklet, Kellogg steam-pyrolysis results have been marked by excellent yields of high purity olefins, in most instances higher than can be achieved by conventional cracking.

Copies of the booklet are available from Kellogg's Chemical Process Division, 225 Broadway, New York 7.

Cutler-Hammer Executive Changes

H. F. Vogt has resigned as chairman of the board of Cutler-Hammer, Inc., Milwaukee, Wisc., effective December 31. Mr. Vogt is retiring after 56 years of active service, during which time he held a number of executive positions. He will continue as a member of the board, which he headed as chairman since 1949.

G. S. Crane, president and chief executive officer of the company since 1945, was elected chairman of the board and of the newly created plans committee, effective January 1. Philip Ryan, executive vice president in charge of manufacturing and development engineering since 1951, was elected president and chief executive officer to suceed Mr. Crane.

5-State Development Underway

Trans-National Minerals, Inc., will use an income of $268,296 a month from its producing oil and gas properties in Texas fields to develop its barite, uranium, and various other mineral properties in Arizona, Colorado, Nevada, New Mexico, and Utah, it has been announced by Lionel N. Childress, president of Trans-National.

Multi-Million Dollar Plant

Plans for a joint venture to construct and operate a Ziegler-type polyethylene plant on the Pacific Coast have been announced by the chemical division of Koppers Co., Inc. and Brea Chemicals, Inc., subsidiary of Union Oil Co. of California. Process designs for the multi-million dollar plant, which will have a capacity to produce 50 million pounds per year of the new plastic material, are being prepared by Koppers Co. A joint engineering team is presently resolving the details concerned with location and operation. The schedule calls for 1957 completion.

Tertiary-Butylamine Production

The first commercial-size plant for the production of tertiary-butylamine in the U. S. was scheduled for completion in December at Monsanto Chemical Co.'s plant in Texas City, Texas. The unit is designed as a flexible plant for the production of a variety of alkyl amines. It is expected that it will begin producing tertiary-butylamine shortly.

Whitman Heads Chemical Engineers

Walter Gordon Whitman, noted U. N. atomic leader, has been elected president of the American Institute of Chemical Engineers for 1956. Professor Whitman is conference secretary-general, United Nations International Conference on Peaceful Uses of Atomic Energy, and professor and head of the department of chemical engineering at M.I.T. Since 1951, he has been chairman of the Research and Development Board, Department of Defense. In addition, he is a member of the National Advisory Committee for Aeronautics.

Professor Whitman was active in industry as assistant director of research for Standard Oil Co. (Indiana) from 1925 to 1929 and as associate director from 1929 to 1934.

Jenkins of ROTHERHAM

Welded

★ Mild steel atmospheric column, 54'0" high x 5'0" dia., ⅜" shell, 9/16" ends, with internal trays. Designed and constructed in accordance with API-ASME Code. Tested 200 lbs. per sq. inch hydraulic.

The Ivanhoe trademark identifies the craftsmanship and dependability of Jenkins-welded equipment. Pipe work, tanks, atmospheric and fractionating columns, condensers, pressure vessels, are typical examples of the fabricated welded work we are producing to Class 1 standard.

Our new catalogue "Welded Fabrications" details our organization and facilities. May we send you a copy?

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Laird Heads P. R. Committee

Judson Laird, in charge of transportation public relations for the Sun Oil Co., has been elected chairman of the public relations committee of the American Merchant Marine Institute. He succeeds Frederic P. Sands of the Grace Line in the chairmanship and is the first representative of a tanker-operating company to head the committee.

Desk And Derrick Elects Officers

Miss Margaret Sweeney of Sinclair Oil Corp. was elected president of the Desk and Derrick Club of the City of New York for the year 1956 at a meeting held November 15.

Elected to serve with Miss Sweeney were: Mrs. Clara R. Snow, Standard Oil (N. J.), vice president; Miss Virginia Swinsoth, Shell Oil Co., recording secretary; Miss Anne Pewatka, Gulf Oil Corp., assistant corresponding secretary; Miss Doris Finnelly, Socony-Mobil Oil Co., Inc., treasurer; Mrs. Mae Masters, Cities Service, assistant treasurer. Two-year directors elected were: Mrs. Marie E. Fleming, Esso Standard Oil Co., Inc.; Mrs. Mary Hanratty, American Oil Co.; Mrs. Gertrude Munafo, Texaco Development Corp.

Harold M. Davidson

Harold M. Davidson, 59, retired refining coordinator of Standard-Vacuum Oil Co., died Nov. 16, at Morristown, N. J.

Mr. Davidson was one of the last three Stanvac executives to escape from the company's refinery at Panembang, Sumatra, before the Japanese occupation in 1942. He reached Australia where he was commissioned a major in the U. S. Army's Southwest Pacific Area forces. He later served with the petroleum section of the Corps of Engineers in Washington. Mr. Davidson also served overseas in World War I as a second lieutenant.

Top-Level Sales Manager Named

The appointment of A. B. McCloskey as general area sales manager for Westinghouse Electric International Co. was announced recently. Mr. McCloskey is responsible for the activities of five sales divisions, comprising the Americas, Europe and Africa, Middle East, Far East areas, and Sales in U. S. A. for Export. He succeeds J. L. de Cubas, whose appointment as vice president in charge of operations was announced earlier.

Sun Oil Dedicates Laboratory

Official dedication of Sun Oil Co.'s new laboratory at Richardson (on the outskirts of Dallas) took place December 7 during a week of special observances. Company activities at this site will include research programs in geology and geophysics, reservoir mechanics, and production technology. The laboratory also will serve as headquarters for two groups supplying general services to the operating departments. Personnel from the former Dallas Production Laboratory and the Dallas Paleontological Laboratory will provide these services and will continue certain research investigations currently underway.

Power Pumps On Color Film

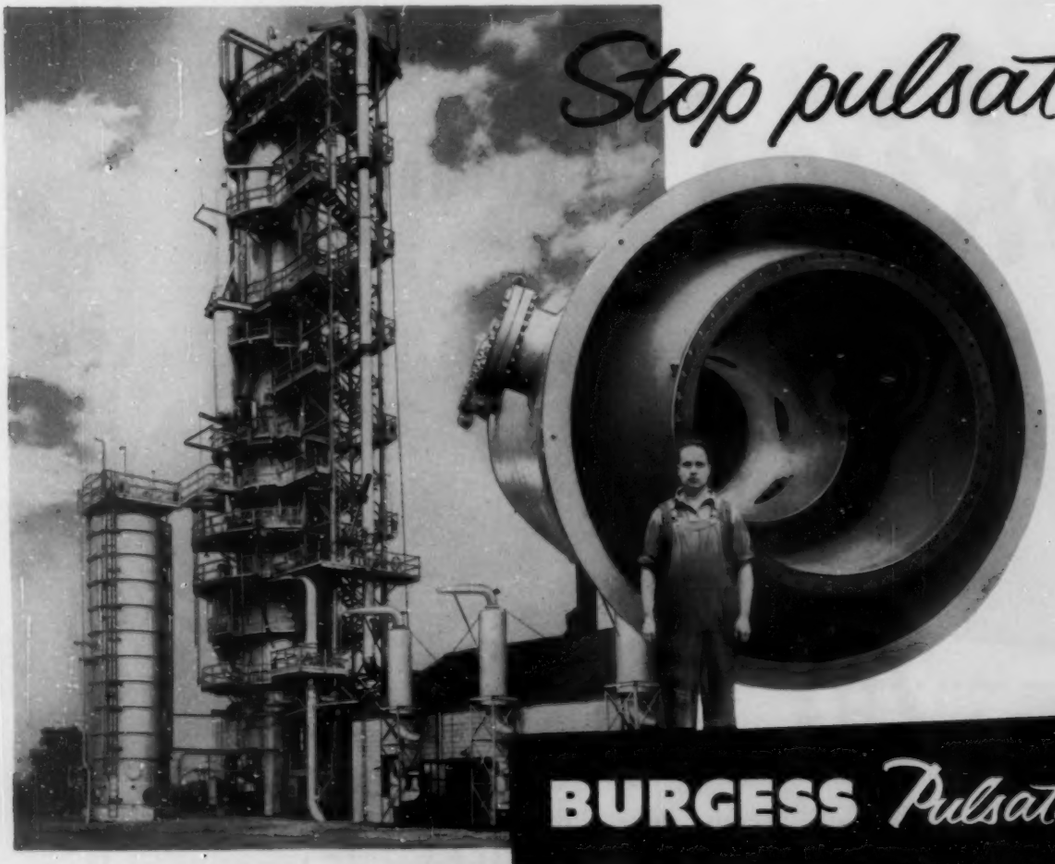
Installation and maintenance of power pumps is visually demonstrated in a new 23-minute sound slide film prepared by Worthington Corp. The film was designed to provide helpful information on power pumps to engineers and operating men engaged in oil and gas recovery, hydraulic press, and other operations.

The film is available for lectures, meetings, and societies where additional know-how is desirable. It may be obtained by writing to Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N. J., requesting Film #G-2198.

Construction workers erect a big spherical storage tank at the construction scene of Tide Water Associated Oil Co.'s Delaware Flying-A-Refinery. These spherical tanks, for storing liquid butane under pressure, are used because the structure of a sphere is more resistant to pressure than is the conventional type tank.

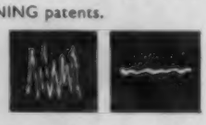
Wyoming Plant Due To Open

Continental Oil Co.'s $700,000 natural gasoline plant, under construction near Sussex, Wyo., approximately 65 miles north of Casper, is to be completed by January 1. It will be capable of processing some 15,000,000 cubic feet of gas daily. Conoco also operates a natural gasoline plant at Lance Creek in Wyoming's Niobrara county and is part owner of a similar plant at Elk Basin, about 40 miles north of Cody.



Stop pulsation . . .

Pipes carrying gas and air under pressure from pumps, blowers, or compressors may fail, or require special reinforcement, as a result of surging and the consequent pulsatory vibration. This problem is overcome by fitting BURGESS Snubbers, which convert intermittent flow to smooth flow—and which, by eliminating a cause of line failure, often effect economies by permitting less costly pipes to be used. BURGESS Snubbers are made to the specifications and design of the original American BURGESS-MANNING patents.



Oscilloscope recording shows pulsation (left) and smooth flow attained after fitting BURGESS Snubber (right).

BURGESS Pulsation Snubbers

Designed by BURGESS-MANNING, DALLAS, TEXAS · Manufactured by BURGESS PRODUCTS CO. LTD., ACOUSTICAL DIVISION, HINCKLEY, ENGLAND.

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In the blinding desert dust storms which sweep the area of the Iraq pipelines, VOKES filters have twice been chosen for the important task of protecting pumping stations and ancillary equipment . . . proof indeed of the important part which VOKES filtration is playing throughout the world in safeguarding plant and machinery from wear, breakdown and unnecessary depreciation.
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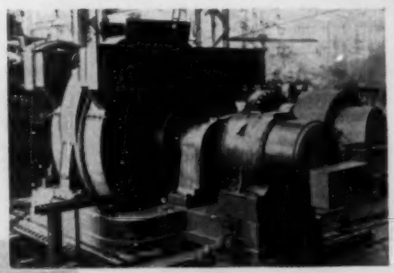

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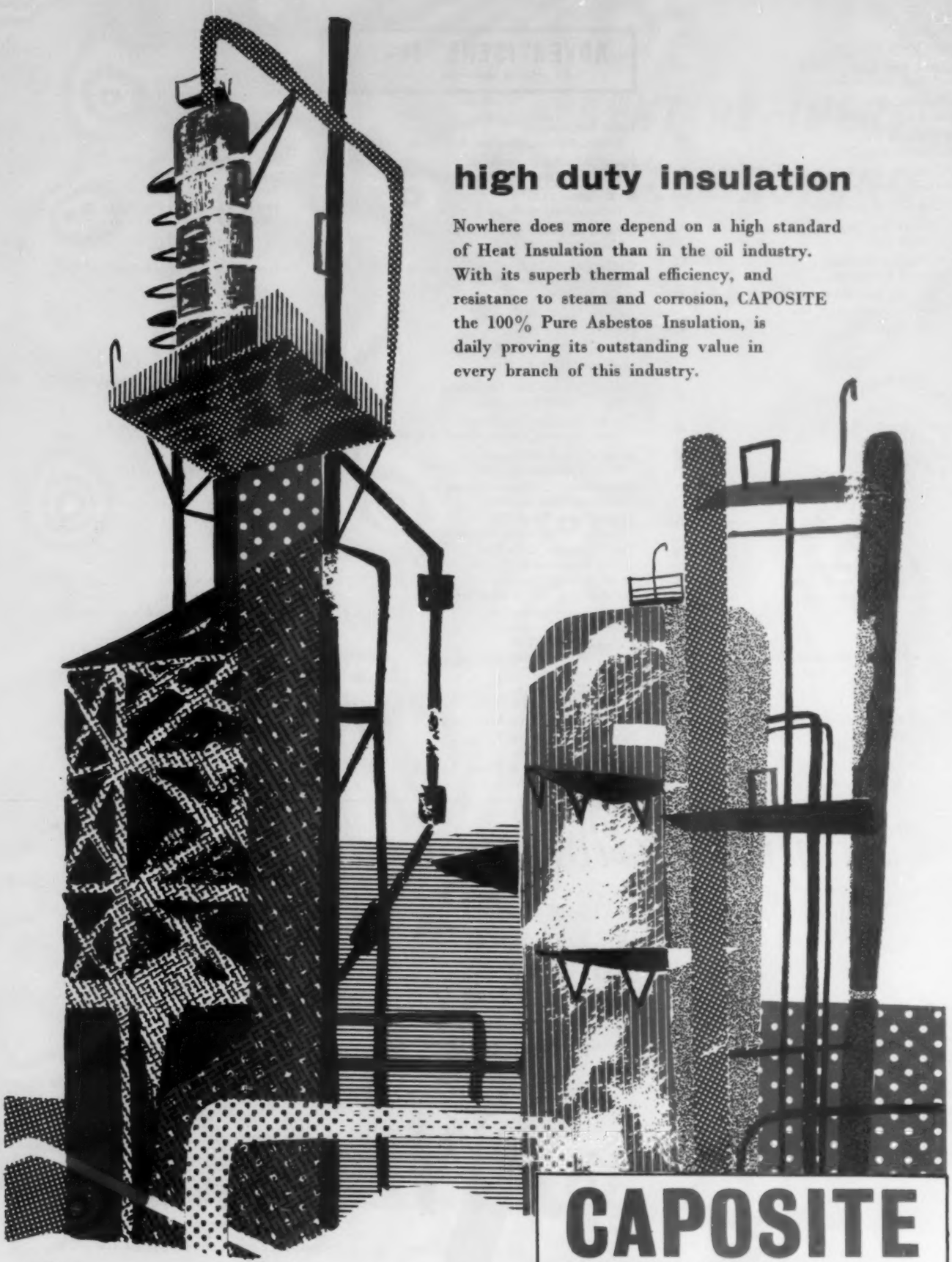

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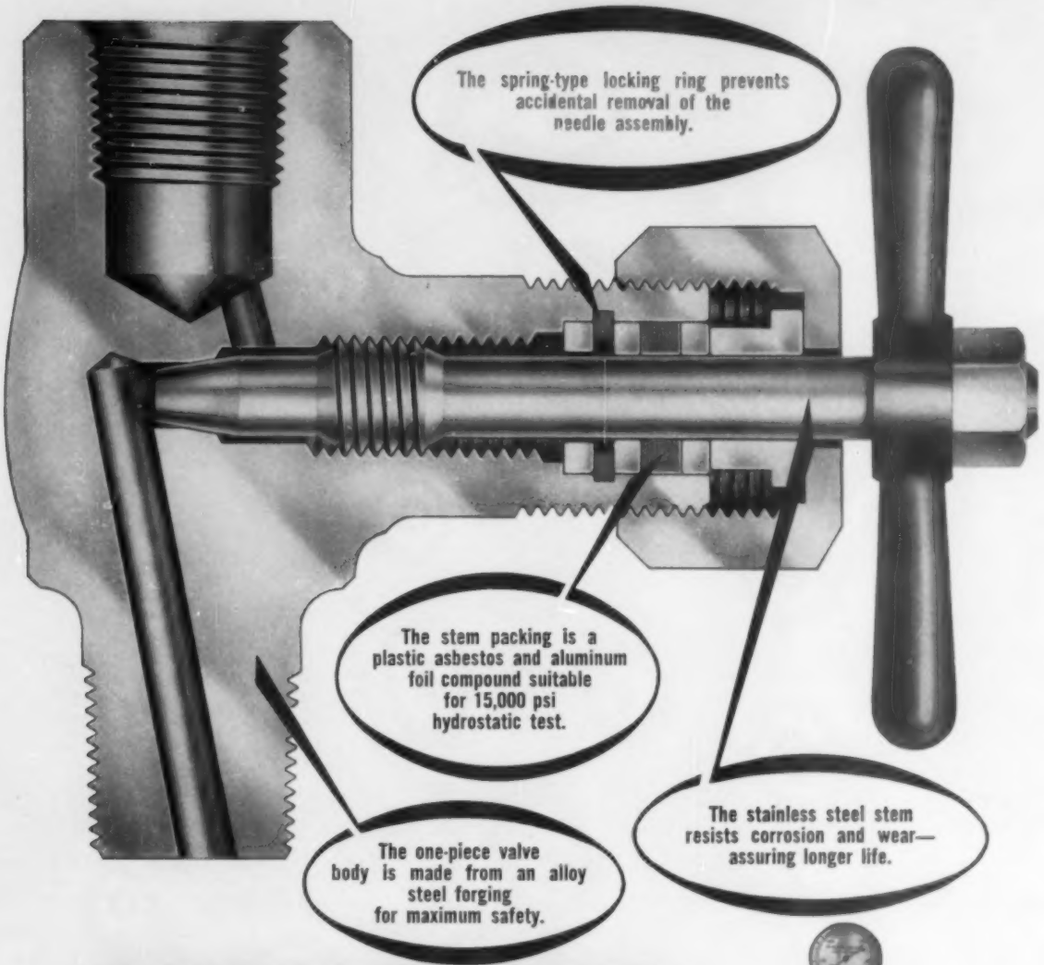
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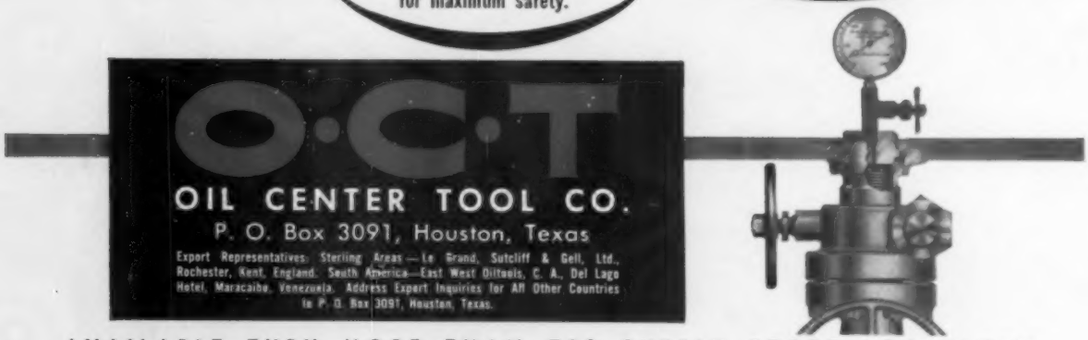

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